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OF THE

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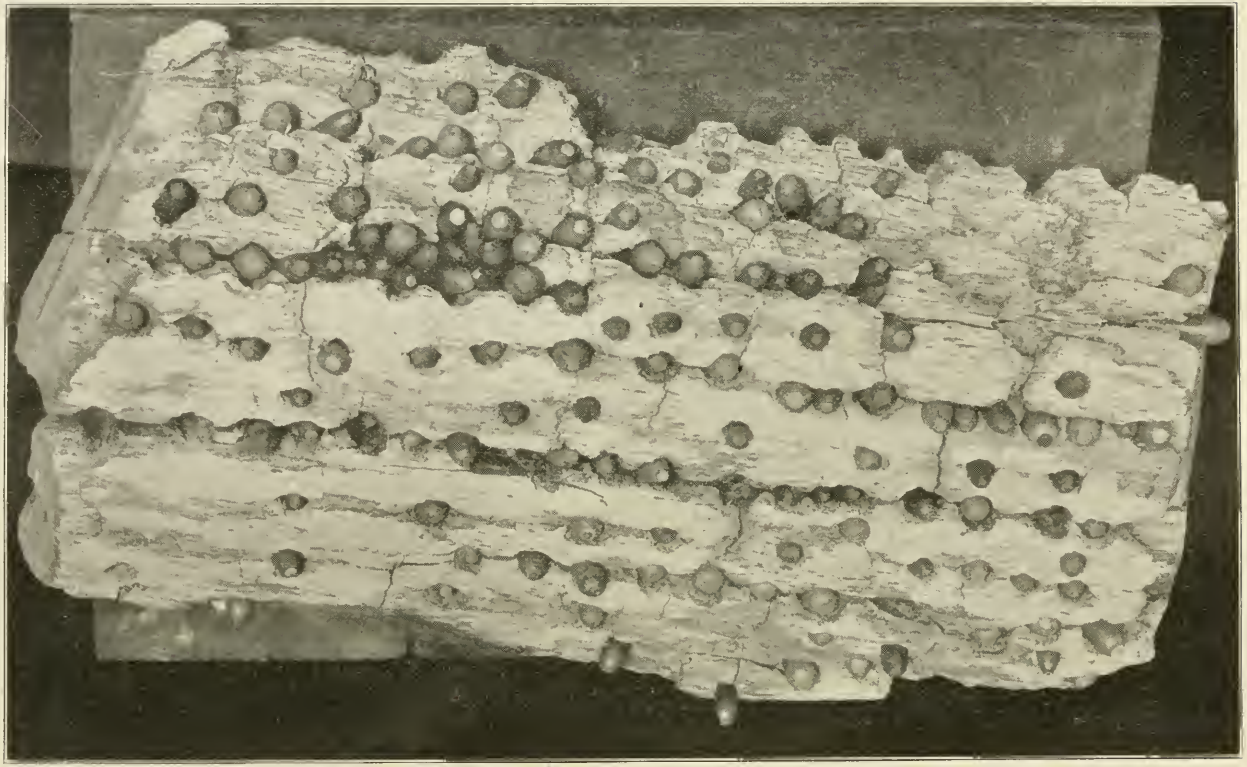

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BULLETIN

OF THE

Southern California Academy of Sciences

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OR

THE CALIFORNIA WOODPECKER

By Anstruther Davidson, M.D.

"The woodpecker came from his home in the tree
And brought his bill to the company
For cherries ripe and cherries red.
A very long bill so the birdies said."

Birds in general are wafted into this world equipped with the weapons and tools nature deems sufficient for their maintenance. The inherited traits of their parents are uniformly transmitted; they live, perpetuate their race, and die. Each generation begins where the other began, toils on unremittingly, and on dying leaves no material inheritance. The homes the birds build perish, they transmit no property rights to their successors, each individual in every generation is a humble toiler like its parent.

To this general law the woodpecker is an exception; he is nature's masterpiece among birds; he inherits something more than habit. He inherits, if not a livelihood, at least the means whereby it may be more easily acquired. He inherits a personal estate, an interest in the forest reserves that makes him an aristocrat among birds.

Time was when the woodpecker had to labor assiduously all the autumn, digging holes in the bark of the pines to contain a store of acorns for winter use. Laborious work it must have been so that between sharpening his beak and digging holes, he must have had little leisure or inclination to develop the artistic side of his nature.

In Southern California the woodpecker digs no more holes, for some of the trees to their topmost branches, 100 feet from the earth, are literally freckled with acorn pits. All that the woodpecker now needs to do is to put a nut into each hole in the autumn and, when he feels like dining to go to the tree and eat a few.

The luxury of being a "gold bug" is nothing to this; it is almost like the rustic's idea of happiness "to swing on a gate and eat bacon all day long."

The most common woodpecker in the coast ranges is the Carpintero (Melanerpes formiciverus, Swainson,) a beautiful bird, abundant where nuts are plentiful, and not at all shy in its habit. The wookpecker's habit of storing acorns for winter use is not at all peculiar to himself even among birds. The jays frequently do the same, but only as a casual piece of thrift; the woodpeckers do it as a matter of business. Trees

beyond number have the bark literally honeycombed with holes, not only on the smooth boles but up among the branches as far as the eye can reach. In the meadows in the San Gabriel Mountains stand hundreds of trees whose bark is pitted almost to the topmost branches. The broad thick plates of bark, framed round with ragged fissures, are studded with holes, sometimes as many as thirty to the square foot. The woodpeckers prefer certain trees, why, it would be difficult to tell. The boles of trees with smooth bark are naturally preferred, and those with fewest branches allow freest digging.

This "winged carpenter" is an engaging fellow, unassuming in his manner, silent in his movements, and gentlemanly withal in his dark suit with magpie trimmings. You can see him any time throughout the summer running along the boles of the trees hunting for larvae beneath the bark, or you can hear his monotonous tap, tap all through the summer morning as he pecks his way through the bark to the grubs beneath. The holes thus made are shallow conical depressions, quite different from those made for the reception of nuts. These last are from 1½ inches to 2 inches deep and are roughly circular in outline but on section are wider at the base than at the outlet. With the ripening of the acorns in the autumn the birds are busiest; their harvest has begun and will continue until the nuts are all collected and safely lodged in the pits prepared for them. In the pine belts the acorns gathered are those of Kellog's oak. These the birds gather one by one, seizing them by the larger end and forcing them into the hole, the opening of which barely suffices for the insertion of the nut. As the hole in the pine bark is a little longer than the nut and of greatest width at its base, the nut falls slightly sideways or is by a dexterous twist of the beak fixed obliquely in a manner that makes it simply impossible to remove it by ordinary means.

In the lower altitudes of the Coast Range, the woodpecker has been compelled by force of natural circumstances to modify his method of storing nuts. Here pine trees do not exist, only oaks, either the live oak (Quercus agrifolia) or the white oak (Q. lobata,) the latter from Encino northwards being in some districts quite abundant. In utilizing the bark of the oak tree for their acorn pits, the woodpeckers naturally prefer the decaying branches as they are easily worked, but these are normally few so that the birds are compelled to form their storehouses by digging in the bark as they do in the pines. Both the live oaks and the white oaks already referred to yield a large supply of nuts. The woodpecker naturally prefers the produce of the white oak which is twice the size of the other and of a much sweeter taste, but the digging of holes for such large nuts is laborious work even for a woodpecker. The bark of the oak is hard and tough, and the holes are in consequence smaller than those observed in the pine

trees, being almost invariably too small to hold the acorns of the white oak. The woodpecker then does the next best thing and stores the acorns of the live oak. These are about two inches long, narrow and tapering, and in their diameter well adapted to the holes they are intended for, but they are frequently so long that they project above the bark in the manner shown in the illustration, producing a curious effect as their white-tipped ends intermittingly reflect the glare of the sunlight streaming through the waving branches overhead. Why the woodpeckers do not use the acorns of the little scrub oak which in size are much more suited to the holes, I do not know. To me they taste quite as good as those of the "agrifolia," but the large species is preferred alike by the Indian and the woodpecker, and these two are excellent judges of nuts.

On account of the hardness of the oak bark the crevices of the surface or any other depression are at times utilized for storing nuts. I found a white oak tree, evidently a favorite with the birds, that was literally studded with acorns, the crevices in the rough bark and the cavities in the broken off branches were packed not with nuts but with the kernals. The kernal of the nut when the shell is removed, splits into two or three sharp-edged longitudinal sections, and the woodpecker after splitting the kernal into its natural sections, drives them edge first into the crevices. To do this with the whole nut would be almost impracticable, and if accomplished the nut would be likely to be dislodged by the swaying of the tree. This is an admirable illustration of how a faculty for adaptation to varied conditions may be but a poor provision for the preservation of the race; for the nuts so stored readily become the prey of such nut-loving birds as the quail, jay, and pigeon, to say nothing of squirrels and chipmunks.

Two or more pairs of birds may be seen storing nuts in the same tree and so long as each pair keeps to its own territory there is perfect harmony, but should one intrude on the other's domain the watchful male with a shrill outcry pounces on the invader and drives him away. The female, as usual, does most of the work and the male sits on the trunk of the tree and advises, incidentally driving away and pilfering intruders, for it must be confessed they sometimes steal each others stores, and as for the blue jay he would steal, and probably does steal all he can lay his beak on. The jay sometimes hoards acorns on his own account, and after the manner of the woodpeckers, but his whole manner suggests that such work is irksome and that stealing is a more congenial method of acquiring food.

When the holes are duly filled the woodpecker has a store of food that only rust or moth can corrupt. It is popularly supposed that the woodpecker stores these nuts until they are infected by larvae, but this like many other popular beliefs, is only partially true. It is true that a large number of these

nuts do become infested with the larvae of a dark brown moth about twice the size of an ordinary clothes moth. The larva of this moth has a bluish white body with a dark head; it is very active in its movements and after boring its way through the shell it soon destroys the kernel of the nut. But these caterpillars attack almost all nuts as soon as they are ripe so their presence in those of the woodpecker's store may be considered merely accidental. Apart from this liability to infection by these larvae no situation more favorable for the preservation of these nuts could possibly be chosen, and if the nuts do become infected the larvae must prove as valuable a food for the woodpecker as the nuts themselves.

How the woodpecker came to do this is one of the interesting chapters in the story of evolution. In some far distant epoch some woodpecker stored away some nuts in a hole and when the winter came and all grain foods and insect life were scarce, he fed on his concealed hoard and survived, while most of his comrades perished. As years rolled on, the more severe winters eliminated all those who failed to obtain food, while those who had stored a winter supply increased till, in the process of time, only such provident individuals survived.

It may reasonably be asked, why do not woodpeckers, like the crow and some other birds, bury their nuts in the ground. It would, primarily be a much easier process, and probably the woodpecker's first attempt at a winter hoard was made in this way. But such attempts were naturally failures even if the nuts did not sprout, as the snow covered the ground at times and would then prevent their exhumation. All these dangers and a greater one are obviated by their present method of storage. Squirrels and chipmunks are particularly fond of acorns and store them under ground for winter use. If the woodpecker did likewise the squirrel would assuredly plunder his winter hoard, but stored in the bark of a tree, the nuts are absolutely safe from these depredators.

Squirrels and chipmunks though not carnivorous are in reality the worst enemies of the woodpecker. From hawks and birds of prey their natural abilities would save them, but in the competitive struggle for existence against the squirrel and chipmunk, only the acquirement of this habit of storing nuts in artificial pits in the bark of trees can have saved them from extinction. There their store is saved from everything but the tooth of Time. When hungry he has but to break open with a few taps of his beak the base of the nut, its softest part, extract the kernel, eat and be filled. Winter snows conceal not his hoard; the blighting frosts destroy it not. The empty shells shrivel with the returning springs, they fall out with the swaying of the tree, or are removed prior to the lodging of the succeeding winter stores; year after year the process is repeated, generation after generation utilizes the inheritance which their remote ancestor toiled to make perfect.

The "Oil Fly" of Southern California

By

Calvin O. Esterly, Ph.D., Occidental College.

These insects are remarkable and unique in that the larvae or maggots (often spoken of as "oil-worms") live in crude petroleum. The fly is named **Psilopa petrolei,** and the larvae may be found wherever there is exposed oil, though they seem to be more abundant in puddles or where the oil covers boards with a fairly thick coating. **Psilopa** belongs to the family Ephydridae, many of whose members are notable for breeding in unusual places. Some of the genus **Ephydra** pass their larval existence in such highly alkaline water as that of the Great Salt Lake or Mono Lake.

Very little is known, apparently, about the habits of the oil-flies outside the laboratory. It seems probable that the eggs are not laid in the oil. I have been able to discover only three eggs and these were in my laboratory on some oil-soaked, but dry, leaves. It is hard to see how the oxygen necessary for the processes of development could be obtained if the eggs are laid directly in the petroleum. The larvae, certainly, cannot live very long outside of the oil. They often crawl out of the petroleum but soon become clean and then begin to curl up, and grow motionless and somewhat dried out; they die in twelve or fifteen hours if not returned to the oil.

The larvae may become completely submerged, but most of them move about just under the surface of the oil, with the tips of their air-tubes showing as minute points above the surface film. Mr. Crawford has shown (Pomona Journal of Entomology, Vol. 4, No. 2) that the processes which bear the tracheal openings can be telescoped so that the spiracles do not come in contact with the oil. It seems not to be known how long the larvae can live without access to air, but it is likely that this protection of the air openings makes it possible for them to exist for some time submerged in oil.

How animals living in such a medium get their food is not definitely known, as yet. It is **possible** that the larvae get nutrition from the oil by osmosis through the body wall. It is claimed, on arguments that merit consideration, that many small marine organisms subsist on nutrient substances dissolved in the sea-water instead of on ingested food. Similar conditions may obtain for the oil-maggots, though it must be said that it does not seem very likely. Another suggestion, made by Dr. Howard, is that the larvae feed on organic particles contained in the crude oil. I have seen the bodies of moths and caterpillars, caught in the oil, covered with maggots which were doubtless actually eating. But so far as my observa-

tion goes there are very many more larvae than can be provided for by such means, and we are almost forced to conclude that there is some other way for them to get food. This might be accomplished by swallowing the oil and digesting the available food material. Crawford states that it is plain that this is "the only way" for the animals to get nutriment. I cannot state from observation that the maggots take oil into the digestive tract. If they do, it is likely that they would ingest some organic material, possibly juices derived from oil-soaked plants or animals. Crawford suggests the probability of the paraffine base of the natural oil serving as food.

I have reared pupae and imagos from larvae that were kept in freshly pumped oil and in that passed through a Gooch filter. Oil as it issues from the pump probably does not contain any foreign particles, nor extracted organic juices. The filtered oil will doubtless be free from bits of organic matter, but not from organic juices if these are present at all. The fact that larvae act normally in such media and undergo their normal development does not, however, clear matters greatly. The larvae experimented on may have been so old that they would have pupated without further feeding, or they may have posessed sufficient stored food to carry them through. If larvae, kept from the very first in filtered or fresh-pumped oil, were to pupate and produce adults, it could reasonably be claimed that they eat the oil or get food from it in some other way. The interest in this question makes it deserving of careful study.

Crawford tells of keeping four larvae in a mixture of petroleum and a considerable amount of white arsenic. One maggot died in three days, the others lived for four days. The experimenter feels that this shows the resistance of the digestive epithelium to poisons, but it is to be suggested that it may show equally well that the arsenated oil was not eaten, though Crawford states that the animals "swam and fed" as in pure oil. The same investigator kept larvae for four or five days in mixtures of petroleum and such substances as clove oil, benzine, cedar oil and turpentine. He found that there was no ill effect so long as the mixture was thick enough to support the animals and keep the spiracles above the surface. This opens the possibility of keeping maggots in media like syrup or gum arabic solution, in the endeavor to discover whether petroleum is necessary for the life of these animals. If they should go through a normal development in syrup, for example, it would show pretty conclusively that they do not have to eat the oil to live.

The pupae are always formed outside the oil so far as I have been able to determine. Dead maggots can be obtained by washing repeatedly, in kerosene, oil that had contained larvae. I have never obtained a pupa-case in this way, but the larvae die in large numbers as is shown by the remains

in the oil. It is noticeable that in places where shallow pools are literally masses of wriggling larvae, the number of adult flies is surprisingly small in comparison. This may indicate that but few larvae pupate in the field. In the laboratory, too, the number of pupae obtained is but a small proportion of the number of larvae. It may be that the dead larvae in the oil furnish a source of food for the living, either through extracted juices or actual consumption of the bodies.

Pupation takes place readily enough in the laboratory, and the cases are generally found on the vertical side of the dish (sometimes on the cover), and nearly always on the side nearest the window. The larvae thus show a very marked positive reaction to light, for a short time, though there does not seem to be any response to light in the pre- and post-pupal stages. I cannot state where pupation occurs in the open, for all the larvae I have seen were reared in the laboratory.

An interesting question for speculation is: How did this habit of breeding in oil originate? It is evident that as far as competition of the larvae with other organisms is concerned, the struggle for existence must result favorably to **Psilopa,** for the immature stages are perfectly protected from other animals that might prey on them. If the larvae are able to get food in the oil, how simple their problem of existence seems to be! It is not probable that the remarkable habit of **Psilopa petrolei** could have been developed gradually. On the contrary, must not this habit and the adaptive structures and constitution of the larvae have arisen suddenly, as "mutations?" At any rate, no matter what views one may hold regarding the method of evolution, the oil-fly shows a most extraordinary adaptation to environment.

Another Mustard Pest

A. Davidson, M.D.

About 1909 the writer first observed an unfamiliar wild mustard on W. Washington St., Los Angeles. Attention was attracted by observing a mustard plant still in flower late in the autumn, in a plot of unirrigated ground. It reappeared or more properly speaking it continues in that locality (for it is apparently perennial) yet and has been observed in many other parts of the city. At the present writing it may be said to be fairly common in many places and extends outside the city along the railway to Chatsworth and East as far as Pomona and Ontario, with a few plants near Riverside. The common mustard, **Brassica nigra,** prefers the heavy clay soils of the region and is purely a spring plant. This mustard, **Brassica adpressa** Moench, like the other, is an old-world emigrant, but

it prefers the dry sandy soils and while it also flowers with the other in the spring time it continues flowering on through the autumn. Dr. Hasse reports it from Santa Monica and says it has only appeared recently.

Mr. Parish writes: "It is a very common weed growing by waysides and waste places and to some extent in cultivated ground throughout the entire San Bernardino Valley and extending well up into the adjacent canyons, say to 3000 ft. alt." There has been some confusion in the identification of the European mustard here and the mistakes have not been all by amateurs, either. Some of those gathered by the writer have been named **B. alba,** a plant so far as I know not at present found here. Dr. Hasse found **B. alba** 20 years ago near Santa Monica, but has not seen it since. Orcutt mentions it as near San Diego. Dr. Robinson in the Synopical Flora mentions it as locally established near San Bernardino but in the supplement (page 469) says "all reference to **B. adpressa** should be struck out. The San Bernardino plant referred to this species having proved to be immature **Sisymbrium officinale** Scop." Obviously Dr. Robinson had not been supplied with material representing **B. adpressa.** The Smithsonian Institute, apart from the specimens sent by the writer, had only one other from the United States, that having been forwarded by Mr. Parish from Potato Canyon near San Bernardino. The natural tendency of most collectors to neglect the more common weeds makes the large herberia of the Eastern museums a totally inaccurate index of the number or distribution of the more homely species.

"To Point a Moral and Adorn a Tale"

The impossibilities of yesterday are the common places of today and the path of progress is now paved with the stones that pseudo-scientists considered impassable obstructions. When it was first proposed to cross the Atlantic by steam one eminent mathematician proved conclusively (on paper) that no ship could carry coal enough to generate steam to carry itself across. Yet it was done. Scientific proof was frequently given that no heavier-than-air machine could fly. Now it is an every-day occurrence. So many apparently impossible things occur in nature that we had supposed no scientist admitted the word impossible now. We were apparently wrong, however. When we published in last issue of the Bulletin the photograph and description of a specimen of **Brownea hybrida** flowering directly from the seed we did so because the matter was one of novelty to us and probably of sufficient variety to interest other botanists, though such a thing must have happened many times before. For what is, has been and will be. A copy of the

Bulletin was sent to a Washington botanist who from his official position might have a special interest in this peculiar specimen and his reply was one that suggested that all the wise men of Gotham are not confined to New York. Here it is.

Mr. H. Hehre,
5621 Central Avenue,
Los Angeles, Cal.

Dear Sir:

Your letter of July 5, with accompanying photograph, is received. I think that you were not at home when I called at your place so that I could see your wonderful new Horto-Mechanical creation. I think you are mistaken in the name of the plant. It should be called **Hehria humbugiensis**. This differs from a Brownea in having three flowers resembling an Azalia and a fourth resembling some leguminous plant and supported by a wire and attached to something resembling a seed. The trouble with the seed, however, is that it is customary in a germination for the outer seed coat to split from the lower instead of the upper end of the seed and is usually forced off by the extending plumule. The plant in the other pot does not appear to be a seedling, but rather a piece of a branch showing some leaf scars toward the base. The photograph being somewhat out of focus and the venations of the leaves obscured by the coloring makes it rather difficult to give you a determination of the leaves. They are not, however, compound leaves and apparently have no relationship to any of the parts included in the right hand pot. If you have any genuine plants that you wish named at any time, we shall be glad to have specimen of the same by mail, but please do not waste your time and ours on such faked work as that recently received from you. The attempt is too crude to pass even an amateur.

Very truly yours,

—. —. ————.

Our worthy Secretary was disposed to resent the imputation of fraud in this letter as reflecting on both our knowledge and integrity, but to some of us it afforded such a joyous glimpse of the potentialities of scientific doubt that we transsribed it for our readers' pleasure and have filed the letter among the Academy's archives for the amusement and possible instruction of our successors. Mr. Hehre mailed the plant in question to the doubting botanist and while it was sufficient to convince him of his error, I fear it spoiled the humor of the situation for him. We may here add that the plant in question produced a leaf below on the flower stalk and apparently is now growing in the normal way.

Notes on the Bionomics of Eugonia (Vanessa) Californica

By F. Grinnell, Jr., Pasadena.

Our interest in the California Tortoise-Shell Butterfly, has been heightened just now by the immense swarms which have occurred all over the Pacific Coast, especially in California, during the year 1911. We have records of it from 1852 to date which give it unparalleled importance to students of insect periodicity. Mr. Haskin's brother reported it in great numbers at Spokane, Washington; and Mr. C. W. Herr found it common in the adjoining parts of Idaho, at Priest River.

In California it was especially noted and studied in Northern California, Siskiyou and Shasta counties; an extended and important article by Bryant (6) was the immediate impulse to write this article, and may profitably be referred to and quoted from briefly. This paper by Bryant was an account of work devoted especially to a study of the part played by various birds in the destruction of these butterflies. The defoliated buck-brush **(ceanothus)** throughout Siskiyou County, indicated the large extent of the depredations of the larvae. The vicinity of Mt. Shasta was most affected, it being particularly abundant at Weed, Igerna, and Sisson on the western base of the mountain; the larvae were reported as abundant at Marble Mountain in western Siskiyou County, and at Weaverville, Trinity County, and 35 miles east of Redding. In Tuolumne County it was abundant (J. B. Curtin.) Bryant spent a week during the latter part of August, 1911, at Sisson, Siskiyou County, collecting data by field observation on the relations of various birds and these butterflies and collections of birds for analyses of the stomach contents. One hundred and fifty individuals of **Eugonia** were counted in one square foot where they had congregated to drink in some damp places. "Often the ground would be blackened by them for many square yards. . . . In order to estimate the numbers flying, counts were made of the individuals passing between two fir trees about twenty feet high and standing about thirty feet apart. The counts for ten successive minutes between 4:40 and 4:50 P. M. on August 20, 1911," averaged 108 per minute. This was going on all over Siskiyou County, and they were all migrating southward. By half past nine they were in full migration. At night they rested on trees, shrubs, buildings or other convenient places. "The species of birds plainly seen to eat these butterflies were the Brewer blackbird, Western Kingbird, and Western Meadow-lark," of which the most efficient destroyer was the Brewer blackbird, which fed entirely on this butterfly; several birds were seen to take an average of

five butterflies each minute, the ground being strewn with the discarded wings.

The first migration of this butterfly was recorded by Behr (3) and took place on November 15, 1856, flying south-southeast; they did not crowd into swarms but flew singly, at a great height; they were seen up to the 18th of the month.

The second migration took place, as recorded also by Behr, in the fall of 1864, but did not reach San Francisco; it was observed by J. G. Cooper at Lake Tahoe; in Oregon (Gabb); it was reported as numerous, but going in no special direction; north of Marin County there were large swarms flying south; and near Tamalpais they were also numerous.

The third migration is recorded by Henry Edwards (4), or rather the remarkable abundance of larvae on Ceanothus bushes on Tamalpais, in May, 1875, millions of them; but the following fall appearance of the butterflies was not recorded or observed; but must have taken place.

The fourth migration was recorded by C. L. Hopkins (5). "During an ascent of Mt. Shasta, made August 29, 1889, a most interesting occurrence was noted in the flight of countless myriads of butterflies **(Vanessa Californica)** at an altitude far above snow-line." The flight was in a southeasterly direction, and in the greatest numbers at six or eight hundred feet below the summit (11,000 or 12,000 feet). "The fact of its being a continuous flight of these insects across the mountain in one direction during the warm part of the day—a period of nearly five hours—is beyond question." It was probably in progress one or two days previous, from the fact that numbers were found dead among the rocks and stones stiffened by the cold. How much longer it continued, there was no means of knowing.

The fifth period of abundance, recorded or observed, was in 1902; but we have little data for this time. Bryant speaks of it, but says it was much less than the year 1911. I remember Miss Alice Eastwood speaking of great swarms on Mt. Tamalpais in the fall of 1902, at the luncheons in the herbarium room of the Academy in San Francisco, with Dr. Behr, Miss Eastwood and the writer. Mr. F. X. Williams (7) recorded it as fairly swarming in Shasta County in 1902; and Mr. J. E. Brown and the writer found it in the mountains near Pasadena during the summer of that year, but rare since then.

The sixth recorded migration, of which we have the most data, and of which we have referred in the work of Bryant (6), occurred during the year 1911. Coolidge reported them common and flying southward in the San Joaquin Valley; Newcomer recorded them in remarkable abundance in the Sierra Nevada Mountains near Lake Tahoe in July and August, and at Palo Alto in October; Clemence took two and saw others in his yard in Pasadena on March 14 and later; the writer took several and noted them as being common in June in the San Gabriel Mountains, near Pasadena; and Haskin noted them

swarming around Los Angeles (but not migrating) during the latter part of the summer and autumn of 1911. And in the fall they were noted in great numbers in the canyons near Pasadena. So it can be seen that the migration and abundance was general over California, and the whole Pacific Coast during 1911, flying south-southeast or south. The recorded periods of abundance are about ten years apart, which indicates its periodic occurrence. Between these dates the butterfly is very rare; only occasional specimens being taken in any locality.

As to the reasons of this periodic occurrence it is probably the coincidence of several factors which cause the abundance of this species in certain years. Bryant found that the pupae and perhaps also the larvae were parasitized to a large extent, about 35%, which might greatly reduce the reproductive capacity of the butterfly. Bryant says "one factor governing the phenomenon is the presence or absence of fortunate conditions of hibernation." And adding the part played by birds. And, of course, meteorological conditions, of which we know so little, quite probably regulates the hatching of the chrysalids over a great number of years; this last seems to me the most plausible factor, but at the same time the least understood. The butterfly appears **suddenly** in great numbers, so it would seem that the enemies play little part, and that favorable or unfavorable meteorological conditions are the real causes.

In Europe **V. polychloros** is nearly related to our **Californica**; but I have no accessible records of any periodic occurrences or migrations, if there are any such. W. F. Kirby in "The Butterflies and Moths of Europe," says: "It feeds on elms and cherry-trees from May to August, and is sometimes sufficiently abundant to be considered an injurious insect on the continent."

V. Californica was described by Boisduval (1) in 1852, he says: "M. Lorquin n'en a pris qu'un petit nombre d'individus." Again in 1869 he says: "Assez rare." M. Lorquin in his brief sojourn evidently missed the years of the great abundance.

In several local lists of California butterflies published between 1902 and 1911, the writers mention **Vanessa Californica** as rare; showing that although a few breed each year, the bulk of the chrysalids await proper meteorological conditions for emergence of the adult; and that seems to be about every ten years, more or less. We will look forward with interest to the years 1919-1921, and be prepared to study this insect again in detail, and compare with its previous record. If any records have been overlooked, it is hoped they will be recorded, so that our history of this insect may be as complete as possible.

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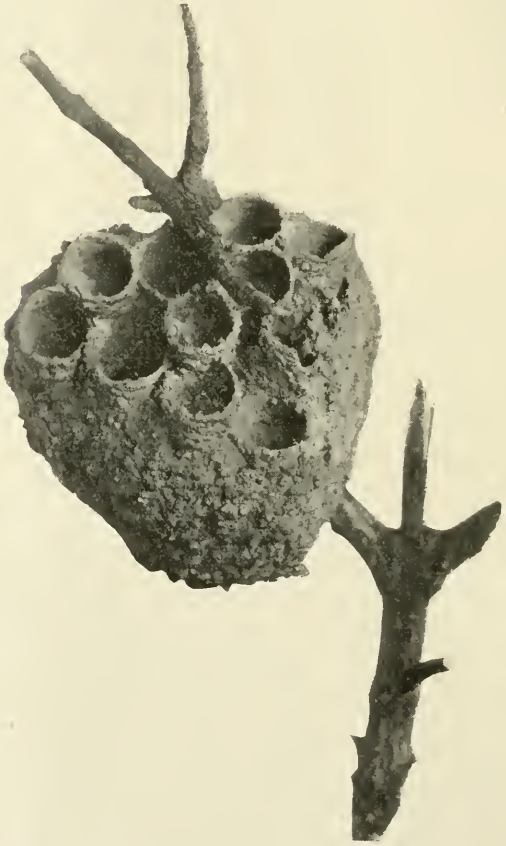
Masaria Vespoides

Anstruther Davidson, M. D.

This wasp makes its appearance in the end of May or first of June contemporaneous with the flowering of Penstemon spectabilis in the flowers of which the homeless males find a refuge from the evening cold. I have found it as far north as Bishop in Inyo County, and it probably is to be found all over Southern California but is nowhere common. In the neighborhood of Elysian Park and in Hollywood hills its nests are not so very rare. Their nests, a combination of cells as shown in the accompanying illustration are built after the manner of the common mud dauber wasp and when completed it is plastered over with a further layer of clay. They are usually attached to a twig in a low bush, the one in the illustration being found on a Audibertia shrub. When the cell is completed the opening is closed by a stopper of clay which is, however, always depressed below the rim of the cell so that the top shows as a series of miniature cups. The clay used is that common to the neighborhood, but in the process of building it is mixed with some secretion that makes the whole of such stony hardness, that it seems impossible any insect could possibly cut its way through it. Perhaps the cup shaped depression on top may be a device to conserve the rain necessary to soften the stopper and render the exit of the wasp possible. That rain or excessive moisture is necessary before the insect can successfully emerge is suggested by the results attained in indoor hatching. In those nests kept indoors in dry receptacles while the wasp usually attains the mature state, it only exceptionally cuts its way out. Kept under these conditions the larvae do not always mature in the following spring as the following record makes evident. Of a cluster of cells gathered in June, 1902; in April, 1903, I opened two of

them to find one had pupated while the other was still in the larval state. It remained in this state till March, 1905, when it died. The other cells were then opened, one contained a live larva, the other four or five contained perfect insects all dead, apparently unable to emerge. The capability of insects to survive for more than one season in the larval stage is probably an evolutionary acquirement, and a necessity to those insects liv-



ing on a food supply that is wholly dependent on climatic conditions. As the writer has shown elsewhere in recording a similar experience with Anthidium consimile, this is a very necessary acquirement in a country where, as sometimes happens, no rain at all may fall, and no food supply would in those seasons be available. The cells are stored with small larvae of what species I am unable to determine.

W. G. Wright

Fordyce Grinnell, Jr.

"The tumult and the shouting dies;
The captains and the kings depart."
—Kipling.

It is our painful duty to record the death this month of a pioneer student of California butterflies, who is known to entomologists the world over, and who will especially be remembered by those of us who were privileged to have known him personally.

William Greenwood Wright passed from this world on Sunday afternoon, December 1, 1912, in the 83rd year of his age. He had been in apparently good health and spirits for some time past. He was found dead sitting in his chair, a newspaper fallen from his relaxed grasp. He must have died between noon and 4 P. M. of Sunday, December 1. The cause was heart failure, and his death was instantaneous and a painless one.

William Greenwood Wright was born near Newark, New Jersey, about 83 years ago, the exact date is not ascertained. His early education was limited. He was a soldier in the Union Army during the Civil War, and soon after the close of that conflict he must have come to California, where he resided a few years in Los Angeles, where his only child was born and which died in infancy. He went to San Bernardino about 1873, where he resided until his death, and where he conducted a planing mill and sash and door plant. About fifteen years ago he retired from active business, and spent his time in collecting and gathering material for his book on butterflies. His wife died a number of years ago and he leaves no near relatives.

His butterflies and library he has left to the California Academy of Sciences in San Francisco. Some other collections are to be sold. Mr. S. B. Parish, the noted botanist, a close friend of Mr. Wright, and the executor of his estate, has given me the few data pertaining to his life that are now obtainable, perhaps when Wright's papers and correspondence are looked over we may have more details; he was a recluse in all phases of his life, and the most we have is the indefinable quality, which only personal acquaintance can give; and his writings and contributions to science.

W. G. Wright traveled all over the West Coast from Alaska to Mazatlan, Mexico, collecting specimens in various departments of natural history, but especially Lepidoptera, but we do not at present know the details of these trips. He published an interesting account of his travels in Mexico in

Zoe, a biological journal printed in San Francisco from 1890 to 1895; an article in the Overland Monthly for 1884, entitled, "A Naturalist in the Desert," and an article on collecting in Alaska which I cannot now locate. Other papers are found in Entomologica Americana, Canadian Entomologist, Papilio, Entomological News, and Edwards' Butterflies of North America. I think the most important contribution which he made to science was the help he rendered to W. H. Edwards in his great work just mentioned. In the Ornithologist and Oologist for February, 1885, we find an article on "An Experiment in Bird Taming," with Phainopepla nitens; his name is frequent in the two large volumes of the Geological Survey, Botany of California, as he was an enthusiastic botanical collector. In fact, as can be seen, he was a **naturalist** in the strict sense; such naturalists are becoming rare as the years go by. His large book, "Butterflies of the West Coast," which perhaps most of you have seen, was published in San Francisco in October, 1905, and was really an epoch-making publication, notwithstanding the numerous inevitable mistakes. The San Francisco fire coming a few months later, April, 1906, has made the book now quite rare. The work was illustrated entirely by color-photography. In a review, I termed his book **rafinesque,** and that perhaps characterizes it better than any other expression, and perhaps applies to his personal manners.

Among the butterflies and moths which have been named in his honor by different men, are: **Melitaea wrightii, Copaeodes wrightii, Scepsis wrightii, Gluphisia wrightii, Leptarctia wrightii, Selidosema wrightiarium.** He named a number of new species, but a good many of them, especially those in his 1905 book, are synonyms.

Wright was a great friend of the two noted pioneer botanists and collectors, C. C. Parry and Edward Palmer, and made many trips with them. He knew many other botanists and entomologists, but the data is not now obtainable.

The following quotation from his book will show the spirit of scientific work: "The most that we can do is to note down the things as we find them; and an aggregation of these notes after a series of years will afford a distinct step forward in the investigation."

I shall always remember my two days' visit with him in August, 1908, on my way back from the San Jacinto Mountains. My pack-burros and myself camped out in his yard and he took me to see the pioneer botanist, S. B. Parish, who was out at the pumping plant on his place, superintending the irrigation of his orchard. We sat down on some boxes and had a pleasant conversation till towards evening, when we went to the house, where Mrs. Parish had set the table for the evening meal. What a pleasant memory this banquet with these two noted pioneers. Then next day we drove out in the neighborhood of San Bernardino to some of Wright's collect-

ing grounds. The two days I spent in San Bernardino were very hot, and the day I was to start for home I knew I should start early to avoid the heat of the day as much as possible. But I was kind of tired and lazy, and remained out of sight in my canvas sleeping bag, till I felt a reminder from some one's foot, and putting my head out of my bag, saw Wright looking down at me, and telling me it was time to get up.

Wright has played his part, doubtless as well as he knew, he has added something to science, and has helped others in their researches, which is as much as anyone can do; for, as Huxley says: "In relation to the human mind nature is boundless; and though nowhere inaccessible, she is everywhere unfathomable."

And we can very well put over Wright's grave, the lines of Shakespeare:

"In Nature's infinite book of secrecy
A little I can read."

The following poem by W. A. Kendall, printed in the Overland Monthly for June, 1872, some of you have read before; but the sentiment is appropriate and appeals to me, and I will read it again:

EVER PRESENT.

The sun of Yesterday is set—
Forever set to Time and me;
Yet of its warmth, and of its light,
Something I feel and something see.

The flower of Yesterday is not—
Its faded leaves are scattered wide;
Yet of its perfume do I breathe,
Still does its beauty stir my pride.

The friend of yesterday is dead—
On yonder hill his grave doth lie;
Yet there are moments when I feel
His presence, as of old, draw nigh.

A part of what has been remains:
The essences of what is gone
Are ever present to my sense:
Though left, I am not left forlorn.

In thought, in feeling, and in love,
Things do not perish, though they pass;
The form is shattered to the eye,
But only broken is the glass.

Sun, friend, and flower have each become
A part of my immortal part;
They are not lost, but evermore
Shine, live, and bloom within my heart.

Transactions of the Academy

The Zoological Section of the Academy met at the residence of Mr. and Mrs. Chas. S. Thompson, 1721 Mission St., South Pasadena, on Friday evening, December 13, 1912, at 8 P.M., Chairman J. Z. Gilbert presiding. The following men were present: Homer P. Earle, R. L. Beardsley, J. Z. Gilbert, C. S. Thompson, C. A. Whiting, and F. Grinnell, Jr.

Mr. C. S. Thompson gave a very interesting talk on ostrich-like birds, their eggs, habits and distribution; illustrated with the finest series of their eggs in North America. He traced their probable dispersion over the world on a large wall map. After a few questions, those assembled went to the "egg room" and viewed the whole oological collection of Mr. Thompson; rarities and oddities from all parts of the world were seen. Many interesting books in his library proved of interest.

To conclude the profitable evening, delicious refreshments served by the hostess were indulged in.

Adjournment at 10 o'clock.

The Entomological Club met on Thursday evening, September 5, at the residence of Mr. H. B. Dixon, 1429 Lemoyne St., Los Angeles, with four men present: H. H. Newcomb, H. Hehre, H. B. Dixon and F. Grinnell, Jr.

Mr. Grinnell exhibited a series of colored lantern slides representing the life histories of a few of the common butterflies; **Vanessa antiopa, Anosia plexippus, Pieris rapae, Fenisesca tarquinius, Pyrameis atalanta,** and slides of **Lim. lorquinii, Heterochroa californica,** and **Lim. archippus,** illustrating the subject of mimicry; and other interesting species. Packard's genealogical tree of the Lepidoptera was discussed.

Mr. H. B. Dixon showed some views on the screen of the Yosemite Valley region, the habitat of some interesting butterflies.

Mr. Hehre, specimens of a curculionid beetle reared from seeds received from Ceylon; and a specimen of a cerambycid from Los Angeles.

Mr. Grinnell, a box of **Hepialus** and other forms of primitive Lepidoptera; and dried specimens of Saturnid larvae used by the Indians of the Mono Lake region as food; collected by Prof. J. M. Aldrich.

Refreshments were served by Mrs. Dixon, during which enthusiastic discussion of various subjects was indulged in.

Adjournment at 10:30.

The Biological Section of the Southern California Academy of Sciences met on Thursday evening, November 7, 1912, at 6:45, at Christopher's, on South Broadway, Los Angeles, Dr. C. A. Whiting, chairman of the Section, presiding. The following men were present: C. A. Whiting, chairman; A. Davidson, W. A. Hilton, C. L. Edwards, Prospero Barrows, C. O. Esterly, L. H. Miller, Theodore Payne, F. Grinnell, Jr., and Drs. Hunt and Lund, R. L. Beardsley, and H. H. Newcomb.

After a sumptuous banquet, provided by the cafe at $1 per plate, during which enthusiastic conversation on various topics took place, Dr. Charles L. Edwards was introduced by the chairman, who spoke on: Recent Work on Sex Chromosomes, illustrated by many diagrams showing the chromosomes of **Ascaris felis,** as studied by the speaker; chromsomes of other forms, especially insects, were alluded to. The sex-determining chromosomes which are believed to be such are variously termed,—idio, x—, y—, hetero—, and accessory chromosomes, have been studied by Wilson, Stevens, Montgomery, Boveri and others, and they agree in essential points. Considerable discussion was aroused which was

participated in by those present. Prof. Edwards also spoke on his work in Nature Study in the city schools.

Dr. Wm. A. Hilton, of Pomona College, spoke briefly on his studies of the nervous system of the tunicates, carried on at the Bermuda Biological Station with Prof. E. L. Mark of Harvard University; his remarks were illustrated by blackboard sketches.

Meeting adjourned at 10:30.

The Entomological Club, of Los Angeles, met on Thursday evening, December 12, 1912, at the residence of Mr. Wm. H. Knight, 621 Witmer St. The following men were present: H. H. Newcomb, R. L. Beardsley, W. A. Hilton, Wm. H. Knight, S. J. Keese, G. W. Schlichten, John Comstock, J. R. Haskin, and F. Grinnell, Jr.

Mr. Grinnell read a tribute to the memory and a biography of the late W. G. Wright; a letter from Mr. E. P. Van Duzee of Buffalo, N. Y., in which he announced his leave of absence for four months to be spent in Southern California, and expecting to arrive in Los Angeles about December 16. A desire was expressed to have him address the Club at some future meeting; and a paper on The Colours of Insects, as a prelude to Mr. Haskin's paper on Mimicry, Poulton's Colours of Animals and Packard's Textbook were freely used in the preparation of this paper.

Mr. J. R. Haskin read a long paper on The Mimetic Relations of some Danaid and Limenitis butterflies, with a general review of the theory of mimicry; the paper was illustrated with a full series of the insects discussed and by blackboard sketches; considerable discussion was aroused by this paper, which was participated in by those present. Mr. Comstock and Mr. Keese recorded a number of instances of having observed birds catch and eat butterflies. This paper will be published in its entirety in some journal.

Mr. H. H. Newcomb made some remarks on the capture of the interesting and rare **Lycaena neurona** Skinner on Mt. Wilson, in September, by himself and Messrs. Haskin and Coolidge. He exhibited specimens of neurona, male and female (which seem to be the same in coloration), and also **acmon**, male and female, taken in the same place. He read two letters from Dr. Skinner concerning the species, which were quite humorous in places.

The meeting adjourned at 10:30.

F. GRINNELL, JR.,
Acting Secretary.

Academy Meeting.

At a meeting of the Academy held October 21, 1912, Mr. G. G. Johnson delivered a very instructive and entertaining lecture illustrated by 100 lantern slides, on "The Panama Canal," as seen by himself during his recent trip of several weeks with the Los Angeles Chamber of Commerce excursion.

Vice-president, Dr. Davidson, introduced Prof. Dozier, who read a letter of information concerning the acquisition by the Academy of a valuable skeleton of a manatee. There was a good audience in attendance.

Directors' Meeting.

At a meeting of the Directors held at the office of the Secretary, 114 N. Spring St., December 23, 1912, there were present Wm. H. Knight, A. Davidson and A. B. Benton.

The matter of program was considered, and it was decided to have for the present a public meeting each month on the first Monday of the month. It was suggested that it would be well to hold the notices of annual dues until the last meeting in January. Prof. Knight agreed

to communicate with Prof. Bailey and secure him, if practicable, for a lecture for the January meeting.

Academy Meeting.

At a meeting of the Academy held in the Auditorium of the Polytechnic High School, January 6, 1913, Mr. Geo. W. Parsons presided in the absence of the president.

Prof. Watts announced the loan to the academy of mineral specimens from the State Mineralogist. On motion the matter of obtaining necessary cases for this display was referred to the Geological Section of the Academy. Prof. Knight announced that at the next meeting, the first Monday in February, Mr. Bailey would be the lecturer. It was also announced that Dr. Konkright has a topographical view of the Panama Canal on exhibition on the fourth floor of the Bullock store and invited the members of the Academy to visit it. It was announced that Prof. Kelsey would attempt to organize an astronomical class at the High School and invited those interested to attend. The speaker of the evening was Mr. Arthur B. Benton who delivered a lecture on the Franciscan Missions of California illustrated by numerous lantern slides.

Henry Hehre died in Los Angeles, at his nursery, 5621 Central Ave., on Friday, September 13, 1912, at the age of 65 years. He was at his gardens in La Crescenta, and was working on a reservoir when he fell in on the concrete bottom sustaining broken bones and internal injuries. He was brought down to Los Angeles, where he died in about fifteen minutes; the accident occurred about 7 o'clock in the morning. Mr. Hehre was born at Brieg, Germany, on the Oder River; left there when quite young, traveling considerably; was married in England and came to Cincinnati where he remained about fifteen years, engaged in making baskets. He then came to Los Angeles, where he has resided for seventeen years, engaged in the making of baskets, but taking up gardening and the collection of plants of great rarity from all parts of the world. He was a very ambitious student in horticulture and had in view a great botanical garden at La Crescenta. His father was a gardener in Germany; and he was always fond of plants, from the student's standpoint rather than for commercialism. This community has lost a devoted student of science, and his one published contribution, printed in the July number of our Bulletin, is of such interest, that it will serve to keep his memory fresh.

F. GRINNELL, Jr.

Mr. Collins, Editor of the Bulletin and Secretary of the Academy is at present on a tour around the world and incidentally enjoying a much needed rest. He has not forgotten the Academy however, as the scientific papers he has sent to the library from his various stopping points have made evident.

We sincerely hope that the condition of his health and appetite is such that he will appreciate being "East of Suez."

BULLETIN

OF THE

SOUTHERN CALIFORNIA ACADEMY *of* SCIENCES

LOS ANGELES, CALIFORNIA, U. S. A.
JULY, 1913

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BULLETIN

OF THE

Southern California Academy of Sciences

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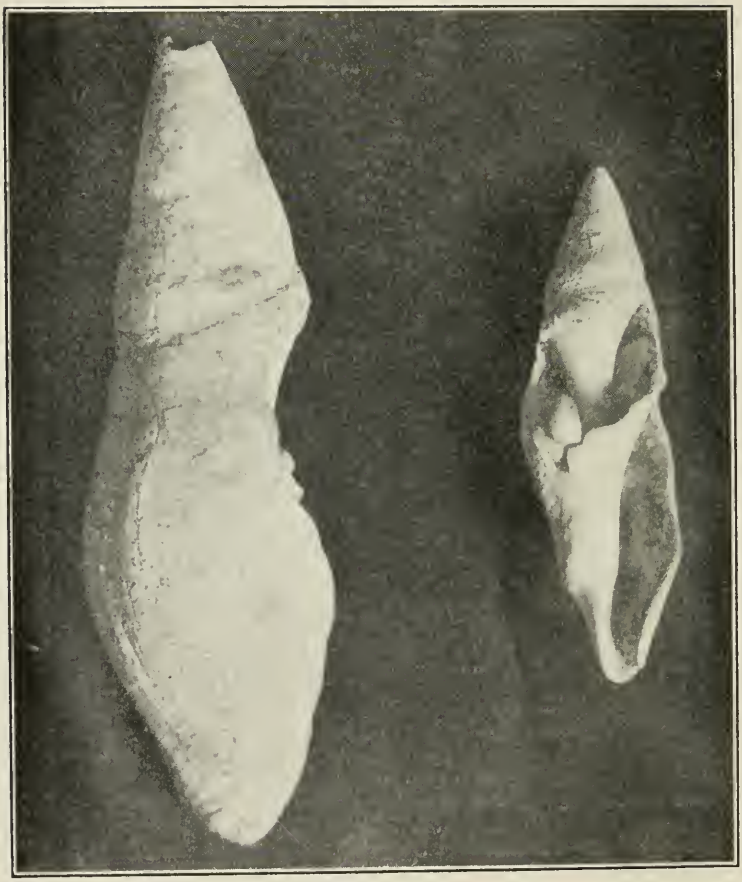


BATHYTOMA CLARKIANA—Rivers

A NEW SPECIES OF BATHYTOMA FROM THE UPPER PLEISTOCENE OF SAN PEDRO, CAL.

By Prof. J. J. Rivers.

The photograph represents two examples selected from six discovered by Dr. F. C. Clark, who has been for several years an investigator of the coast species of both fossil and recent Mollusca.

Dr. Clark and myself have a partnership in Paleontology, each holding equal rights under the firm name of "Rivers & Clark." We have done no business transactions. Dr. Clark does most of the excavating of Strata, while I have the delight to nominate the species when I am able, but there is such a bulk of material that neither of the compact can resolve satisfactorily. Our material is great, and unless we can obtain the assistance of Dr. Dall of the Smithsonian Institution, years will elapse before a complete catalogue will be forthcoming.

The photos submited to you have also been sent to the scrutiny of Dr. R. H. Tremper of Ontario, and his reply reads thus: "The photo is very interesting. I suspect your shell represents some extinct form of Bathytoma. I have not seen a specimen of this genus so long as, nor so attenuate. Your fossil is not B. Tremperana of Dall. The latter is a very different shell and very much smaller, good sized specimens measuring 67 mm; body whorl 32 mm, spire 35 mm, making the body whorl shorter than the spire, while in your specimen the body whorl measures 68 mm and the spire 48 mm (if restored)."

Bathytoma Clarkiana Rivers. I name this in honor of my colleague, Dr. F. C. Clark of Santa Monica, Cal.

The fossil is heavily charged throughout the whole of its structure with carbonate of lime. The columella is thicker than in any described species. If the shell be placed with its aperture downwards, many concologists would have an opinion that it must be a species of Exotic Mitra. But there are none of the known species of Bathytoma that represents this form in its attenuate outline. This figure will explain the oblique condition of the sutures that divide the whorls. The sculpture has mostly been eroded, but in parts the sculpture represents the true features of the genus.

Bathytoma Clarkiana Rivers restored measures 116 mm over all, the body whorl measuring 68 mm, the spire 48 mm.

HEREDITY EXPERIMENTS WITH JUNONIA COENIA

By Wilhelm Schrader, Los Angeles.

On July 5th, 1911, we caught a fertile female of **Junonia coenia** (Hübner) in Los Angeles, which to all general appearances had the same color and markings as our usual form; from this specimen were obtained some eggs and 100 caterpillars were raised in the normal summer temperature; and 31 caterpillars were raised in the incubator where the humidity was very dense, and varied between 70° and 90° F., and the temperature was 80° to 90° F. The caterpillars in such a dense humidity and high temperature need the very best of care, because such conditions easily produce the so-called "wilt" disease; caterpillars thus affected grow mostly to their full size, then become soft and die in about two days, hanging usually by their middle legs, sideways, on the food-plant or walls of the cage. Even the chrysalids will get this disease and turn dark and die.

This disease is contageous and often appears in the next generation of the caterpillars, even after the greatest care and isolation; the best remedy seems to be to place such affected stock in cool air, and clean the cage often, separating all caterpillars which feel soft, from the others.

In our other experiments with **Junonia** bred in the same temperature and humidity, the parents of which were also caught in Los Angeles, from which we have now at the time of this writing, the 35th generation by inbreeding, the ocelli of the forewings evolved an appendix beneath; this change in the marking appeared already in a few in the second generation, beginning as a little separate point as described in the Pomona College Journal of Entomology, Vol. V., Nos. 1, 3, and increased in size and percentage in each following generation, by inbreeding and raising in the same temperature and humidity.

Now, from this newly caught fertile female, the descendants from which were 31 caterpillars in this part of the experiment, bred in the same temperature and humidity, the ocelli of the hindwings became, in the first generation considerably reduced in size; while the size of the butterfly, on the average, increased in wing expansion very considerably over that of the rather large mother; even the males, which are usually smaller than the females, were larger than this female; the ground color of all these butterflies was darker; the two orange-colored spots of the forewings, near the costal margin, were larger than is usual in our local form. All **Junonia** bred in a hot temperature and humidity become somewhat darker, however, not so dark as this new line; the forewing showed another new development, as seen in the direction that the

scales overlap, a purplish color appears (iridescence), whereas when seen in the opposite direction these scales appear black; and in a few of the females the large ocelli of the hindwings had the centerfield purple in color as seen from all angles; however, not one was obtained with an appendix or enlargement of the ocelli of the forewings in this brood, as occurred in our other, former experiments. The butterflies from the 100 caterpillars from the same mother, however, raised and developed in a normal summer temperature were like the mother in size and color, and we did use this lot of butterfles for further experiments.

Our other line of experiments with **Junonia**, from which we now have the thirty-fifth generation, were never crossed with any other from outside, but always inbread; it is remarkable that we, by doing so, could keep the size of the butterflies the same. As we had now in this new line exceptionally large males as well as females, we wished to improve the size still more; so we divided all the fertile females into two lots, and intended to cross them in each generation in the following simple manner: We will name one lot (a), the other (b), when we take in each following generation the males from lot (a) and pair these with the females out of lot (b), and the males out of lot (b) paired with females out of lot (a), we could not fail to get the blood mixed. We got plenty of eggs from different females of the first generation bred in humidity, and we kept these separate in two lots, each of 100 caterpillars, raised these in about 80°-90° and humid air, as in the first generation from which we obtained the large butterflies; we provided the caterpillars with the very best food; however, in this high temperature and humidity some of the caterpillars got the wilt disease, and some when still quite small will get lost or killed in changing the food. This generation we bred a full cycle, from the egg to the butterfly, in the short time of one month; whereas this butterfly in our normal summer temperature makes usually only two generations in the summer season; and in the winter season remain mostly as chrysalides.

Our average temperature for hatching the eggs and raising the caterpillars was about 80°, and for the chrysalides 90°; we had for these experiments no self-regulating incubator, so the temperature was not always the same, and we here take from the notes which were written regularly three times each day, the average temperature. We have found in former experiments by breeding the chrysalides in a small self-regulating incubator that the butterfly shows no marked difference in color and markings, whether always bred in 80° or in 90°-95° temperature, only the time of emergence of the imago becomes shorter as the temperature becomes higher; when, however, these chrysalides are exposed for a long time, un-

interruptedly, in a higher temperature than 95° and in very humid air, they will produce many weakly and not well developed butterflies, or will die; when, however, chrysalides exposed to as high as 115° temperature for about two hours daily, the butterflies will emerge, then, sometimes about two days later than the regular time of five days from the chrysalides bred in 90° temperature, and will then produce mostly some rare aberration in color or markings.

Lot (a) in the second generation produced from 100 caterpillars, 32 females and 35 males; the wilt disease got hold of a good many caterpillars; however, we saved enough to give us a fairly good bunch of butterfles to continue this experiment and show the percentage of change in color and markings. The males had the normal color of our local form except dark in ground color; from the 32 females, three of them had the large ocelli of the hindwings purple in color, and these three females had also the most purplish color on the forewing; with this butterfly the female is always progressive in development of new color and markings, only in later generations when the percentage of the change becomes higher, then the males will get these changes also. The reduced size of both ocelli of the hindwing was, in this generation, still more reduced in many specimens, in males as well as females.

Lot (b), also the second generation, developed 18 females and 26 males and the percentage of change in color and size of the ocelli was about the same as in lot (a). We retained some of the purple females for breeding, alone in a cage, and succeeded in obtaining enough eggs in both separate lots of butterflies, with purple color, to secure our experiments; however, we had, at that time, not enough space and time to keep the more yellow ones, which were colored like our local form, and we were more interested in this new purple color, and wished to improve this by selection.

In our third generation we obtained in lot (a) 42 females and 35 males, and in this generation we had about 50 per cent with purple ocelli on the hindwings, and also the males had about the same percentage of purple ocelli. The lot (b) developed 58 females and 55 miles; here the percentage of butterfles with purple ocelli was also about 50 per cent. Many more had the innerfield of these ocelli not quite full purple, there was a small space of lighter color left in the upper circle; it is for this reason very difficult to give the exact per centage of the change of color. In this lot (b) we got, for the first time, three females with a very small spot directly under the ocelli of the forewings, just the same way that the newly developed appendix of these ocelli started to develop in our old line of experiments described in Pomona College Journal of Entomology. However, this small start, in later bred gen-

erations, was lost. The reason for this is, to us, not yet clear, as in this new line the ground color of all wings is much darker than in the old line of experiments, consequently there is no want of dark pigment in the new development; the only reason we can see, so far, lies in the fact that the ocelli in the butterfly of this new line of experiments are much smaller than the ocelli of the butterflies of our old line, and many butterfles of our old line developed first a larger ocellus of the forewing and only then developed the appendix.

The fourth generation developed, in lot (a), 28 females and 23 males; and lot (b) 23 females and 15 males; there were in this generation about 40% with purple colored ocelli; the reason for the smaller percentage with purple color seems to be that the yellow color is a dominant one over the purple, and as the more yellow color was fixed in the mother, it will take some time before the purple color is steadily fixed.

The fifth generation, in lot (a), developed 56 females and 65 males; and in lot (b) 42 females and 40 males; about 50%, had in this generation, the new purple color. As by this crossing method the size of the butterfles did not increase as in the second generation, we gave it up for want of time and space, and continued in a single line by inbreeding, without crossing. As we had much trouble in the caterpillars with the wilt disease, we raised the sixth generation of our caterpillars in a cooler temperature to stamp out this disease.

We made another experiment with this new line of butterfles by picking out from the second generation, bred in humid air, the males and females which showed the most purple color on all the wings, and obtained many eggs from these extra selected purple ones; we raised the caterpillars also in humid air, the temperature being on the averag 75°, a little cooler than the above described to prevent the wilt disease; and bred the chrysalides, as the others, in 90° temperature and humid air. We obtained in this line of experiment, which formed the third generation, 81 females; 45 of these had the large ocelli of the hindwings purple, and the forewings had in many a good purple color; and 80 males, 36 of these had the ocelli purple and a few had also some purple color on the forewing. In this lot they were all well-developed but none as large as those in the first generation; the percentage of the purple colored examples was higher than in the other third generation which we had crossed in each generation; the males, especially, showed the purple color well, as compared with the other third generation; this higher percentage was undoubtedly due to the selection of the most purple colored parents. As the descendants of the other line did not increase in size by crossing the same in each generation, we crossed none in this line, and had for that reason a much better chance to select the very best stock of the most

purple colored males and females—because we did not need to divide them and all came out more at the same time.

As we had many good purple colored females and males we selected again the very best ones, and in the fourth generation we got 64 females, all of these had the purple ocelli and in many the forewings purple in color; and 77 males, 35 of these had the ocelli purple colored—the number of those which had a purple color on the forewings is difficult to say, as that color, there, is very varied in extent. This increasing of the percentage of purple colored, and the extension of this new color almost over the whole forewing, was without doubt the result of our selections, and we continued this line in the same way; however, the butterfles for a few months in the spring of 1912 had to be bred in a cool tent without an incubator, before the glass house was finished, so the time of breeding a generation became extended; this had, however, no bad effect on our purple color improvement, and in the ninth generation we had the females, as well as the males, all with purple colored ocelli on the hindwings.

In the eleventh generation we had trouble with some very small parasites which infested eighteen of our chrysalides, and before that time the ants carried off many eggs over night before their presence was discovered, so that in this generation we got only a very few females, and these emerged so tion we got only a very few females, and these emerged so weak and died before pairing. The only course left open to us to get some good eggs of the purple colored females was to pair these females with males of our other stock from which we had now the thirty-first generation of butterflies. We selected for this purpose six of the best developed males and these males had the ocelli of the forewings greatly enlarged and had the black appendage thereon as developed in the line of expriments bred in humid air as described in the Pomona College Journal; already on the next day we saw a pair in copula and put these carefully separate in a wire cage with a pot-plant of Linaria cymbalaria whereon the females deposited their eggs.

Here we come to the most interesting part of our experiments from a scientific point of view; we could find here what the law of heredity would produce if any such law exists. We had two main separate characters to observe; in the male we had the large black ocelli with an appendix on the forewing, this appendix is developed by breeding in 90° temperature and humidity and by inbreeding, without crossing, and selecting the specimens with the largest appendices we developed these appendices to a large size; and there formed in many, mostly females, a little light-colored center, we had then double ocelli (connected together), the surrounding white field remained in extent the same as in our local

form, but became considerably smaller because the enlarged and double ocelli took up most of the space of the white field. In the female we had the purple colored ocelli of the hindwing, and the same color greatly extended from the base of the forewing along the outer margin extending over the middle field and forming a smoky blue margin to all the wings; the same white field in extent as our local form and the same ocelli.

These were the two separate characters of the male and female used in this crossing, which could not be changed by breeding each species, separately, in the same temperature and humidity, and these characters did not change by breeding the descendants for a few generations in a normal temperature, they were temporarily fixed; it was now a question which one of the markings and color characters was the dominant one? We obtained a few more egg-laying females of this crossing experiment, and bred these in the incubator in humidity, the eggs of the first-found female we bred in a normal summer temperature in the glass-house, and raised the caterpillars of this lot there to keep them free of the wilt disease; and as these grew slower we will first describe the result of the other lot of the crossing experiment in which the caterpillars were raised in the incubator and the chrysalides bred in about 90° temperature and humidity, just like the parents.

In the first generation we obtained 31 females, 7 of these had, on the forewings, the character of the male, however the ocelli and appendices were smaller and showed in that way the influence of the female with the small ocelli without an appendix. The ocelli of the hindwings were, in the lower half of the circlefield, more of the purplish color than the male of the crossing, and this purplish color extended, in a few females to the upper half of the circle-field, showing in that way the influence of the female with a purple colored ocellus; however this influence was not strong enough to produce a clear purple color, and in all these ocelli was a small yellow circle left in the upper half, the further up the purplish color extended, the smaller was the yellow ring. We obtained 37 males, all of which had a smaller ocellus on the forewing, and none had an appendix; as the males had adopted this appendix only in the later bred generations and then not all of them, and therefore the females of the crossing experiment with the small ocelli had more influenced these 37 males. In the hindwing the influence of the purple-colored female was about the same as in the females of this first generation. As we had learned that selection of the colors will increase the same and will, in later generations, give a higher percentage of the selective color, we picked out the males and females which showed the most purple color, paired these separately

in a wire cage and bred the descendants in the same temperature. We obtained in the second generation of these selected ones with the most purplish color, and we got nine females in which the characters were much mixed; as we lost many caterpillars through disease we did not get many butterflies, and it is therefore not possible to give the exact influence of one or the other.

Three females had the double ocelli, of the male, on the forewings and the purplish color of the female on the same wing; and the hindwing showed the yellow ring, also a characteristic of the male, but smaller and the circle-field little more purple; two had all the characters of the male, including a double ocellus; one had a small appendix on the ocellus of the forewing, but showed much purple, two had no appendix, and had the yellow ring around the hindwing ocellus nearly lost; and one had a double ocellus and purple color on the forewing, and in the ocellus of the hindwing the inner circle-field was completely purple in color. We got 12 males, three of these had a small appendix on the ocellus of the forewings; seven of them had the purple ocellus of the hindwings complete, the other five had this ocellus only partly purplish in color. Upon the whole we find in this second generation that the selection of the most purplish colored butterflies for this experiment improved the purple color, and we got a higher percentage of those with that color. We selected the one female which had the ocelli of the hindwings completely purple in color and mated this with similarly colored males; this female had also a small double ocellus on the forewing. In the third generation we obtained 10 females and all had purple ocelli on the hindwings, three of these had a small appendix not formed to a double ocellus like this selected mother had; the forewing showed the purplish color in some specimens much extended, not only in the dark scales, but had taken the place up in the two orange yellow colored spots near the costal margin, so that no yellow color was left. We obtained 13 males and also these had now all the characters of the purple female. In all those from the mother in this generation had double ocelli of the forewings; this was so much influenced from the characteristic small ocelli of the purple-colored ones, that they showed only in three females and was therefore so much reduced in size, that only a moderately sized appendix was left.

Now we will say what became of the first pair which we found in copula and of which we raised the caterpillars of the first generation in the glasshouse in normal summer temperature to keep them free of the wilt disease. When these caterpillars were almost full grown we put them in the incubator in about 80° F. and humidity, to keep the parasites from the chrysalides, the glasshouse was full of these little flies, but

seem to not go inside of the closed dark pupa boxes, but will crawl through ordinary mosquito screen. The chrysalides were bred as the others in 90° temperature and humidity; we got in the first generation 25 females and 16 males; they all had the large ocelli of the hindwings a little more purple in color, but had retained the yellow semi-circle in the upper half, just as the other lot in the second generation.

We obtained in this first generation, however, some butterflies with abnormal parts, which are worth, accurately describing here. We noticed that one of the caterpillars was somewhat deformed, and as this was the first one that was seen in five years of breeding many thousands of **Junonia**, in that time, we put this peculiarly shaped caterpillar in a separate cage for further observations; the body was, from the head to the fifth segment, straight and normal, when at that point it bent into an elbow occupying two full segments, and then the remainder of the specimen was normal; the hind part of the body was in that way turned to the right fully half the thickness of the caterpillar; the chrysalis was in all outer appearances normal; the butterfly had three normally developed wings, but the left hind wing remained small and wrinkled, a piece of the pupa-case still hanging to it, and this seemed to have stopped the expansion of the wing; this piece of the pupa case may stand in connection with the abnormally shaped caterpillar. One specimen we obtained had the right side male and the left female in characters, a hermaphrodite; this is the second phenomenon observed in our **Junonia** breeding experiments. We obtained, however, five females and one male with abnormal antennæ, and this is remarkable as up to this time only some small malformations were observed in rare cases in these delicate organs; as they emerged some days apart a possible sudden rise or fall in the temperature by breeding could not have caused it; the causes of these many abnormal malformations seem to stand rather more in some way in connection with our crossing of the different colors and markings of the male and female; besides the above named malformations, some females had the color of the wings abnormal. The malformation of the antennæ consisted in one female of having no antennæ at all, and, furthermore, had only one of the two organs known as the labial palpi; another had no antennæ and no palpi; as these two palpi have their place on each side of the tongue which is rolled up when not feeding, this butterfly could not hold its rolled-up tongue concealed, and it was therefore, most of the time, stretched out in a semi-curve, the tongue seemed also somewhat shorter than in other specimens of the same size. One had only a left antenna; another had only a quarter length of the left antenna without a club at the end; one male had only the left antenna normal; and the last one, a female, had also no

antennæ, but the palpi were normal. As there is some difference of opinion among scientists as to what the antennæ are used for, whether for feeling or smelling, or both senses, Mr. Schrader observed these butterflies while starting to feed them with sugar water on his finger tips. **Junonia coenia** is a very tame butterfly when bred inside of the house; it will walk on the finger tips when sugar water is placed thereon and pushed near its head; it generally stretches first its tongue for sucking, then bends sometimes only one or both the antennæ at the same time, down to the sugar water, so that the club touches for a moment the place where the sugar water is, and repeats this several times. These butterflies with the abnormal antennæ acted just the same way; the two with only one antenna sucked first, then bent the antenna several times, and one of them, several times, lifted a leg upward towards the head, on that side where an antenna was missing, as if to learn what had become of that antenna; the two with no antennæ had no trouble to find the sugar just as quickly as one with normal antennæ, and lifted the legs upward like the first one. It seems that in this action of feeding, normally as well as these deformed ones, that they know the presence of the sugar water before feeling with the antennæ, and even without antennæ. By feeding clear water they act in many different ways; some feel with the antennæ without sucking, and some suck without feeling, and a fertile female, if taken from a resting place and set on the caterpillar food-plant, will generally first bend the antennæ down to the leaf before laying eggs; it will require further extensive experiments in that line to learn more about it. On the first day our abnormal butterflies kept more on the bottom of the cage, whereas the normally formed ones sit mostly high in the cage. We place the moist sugar-cloth generally on the pot of the plant on which the eggs are laid, but this time we placed some on the bottom also, for the butterflies without antennæ; however they mingled with the others on the next day. Because we had only one male with a single antenna, we put some other normally formed males in the cage with only abnormally formed females, to secure a mating. As we had selected in our other experiments from the descendants of the crossing, the most purplish colored males and females, we selected this time for these abnormally formed females some males which had the most yellow color, to find out if the descendants would get again the full characters of the male used for crossing.

We found the female with only a quarter length of antenna and no club on it, in copulation with a normally formed male, obtained eggs from this female and raised the caterpillars while young in the glass-house like the others, where

we obtained the abnormally formed butterflies from. We obtained in this second generation 17 females, 10 of these had most of the color characters of the yellow male; however, the appendix as the male had it which we used in crossing, was found in only two of these females, and only small; the other seven had some of the characters of the purple female. We obtained 15 males, 12 of these had the color characters of the yellow male; and three had the ocellus of the hindwing almost purple in color and some purple on the forewing; of these males only one had a small appendix. In this generation we obtained one female with the right antenna missing; another had the left one missing; and one with the left antenna the full length, but the right one of only a quarter length, and a little club on it.

When we obtained these abnormally formed specimens in the first generation, we still considered it as an open question, if not possibly by accident the missing antennæ were broken off; however, this was never before observed, and it seemed almost impossible, as these thin organs are very elastic as long as the butterfly is alive. Now, however, that we got this phenomena repeated, in some of the descendants, it is without doubt a natural phenomena which is inheritable. Especially the last one with one antenna the full length, and the other only one quarter length, and still a little club on it, is of some significance.

We tried the feeding experiment once more, the first emerged female, with the right antenna missing, was put alone in a cage and not fed during the first 24 hours; the next morning we placed a moist white sugar cloth near it, and it started to suck immediately; it must have been very hungry by this time, but, all the same, it did not fail to bend six times, the one antenna to the sugar cloth; then we pushed a piece of white paper over the cloth, it rolled up the tongue, and never bent the antenna on the paper or unrolled the tongue; after the paper was removed, sideways, it sucked again, without feeling, to appease its hunger.

As it is well known that **Junonia** is one of the highly developed butterflies which turns, generally, its tail in the direction to the sun while at rest, for the only reason, we believe, to see better. To find out if the antenna had anything to do with this habit, we turned the sugar-cloth in a circle, horizontally from left to right; this butterfly turned just as quick in the opposite direction to retain its customary position without interruption from feeding; we repeated this turning around, but changed the direction from right to left, and this butterfly also changed the direction, however, not always; and it seemed to become tired, or found it useless to turn any more; after eight times repeated turning it re-

mained quiet in the other direction, but only for a short time.

THE ACACIA WEEVIL IN SOUTHERN CALIFORNIA.

By Theodore Payne.

The Acacia Weevil (Bruchus pruinianus Horn)* is now quite common in Southern California, infecting the trees of a number of species in many different localities. How long it has been here I am unable to say, but it first came under my personal observation in the fall of 1904 in some seed of Acacia mollissima gathered at Santa Monica. This seed was collected in the early part of September and a few weeks later quantities of the weevil hatched out.

A peculiar fact is that they do not all hatch the first season, usually a few weeks or sometimes months after the seed is gathered a batch of the weevil will hatch out. The next year another lot will hatch and a year later still a third.

From the appearance of the seed when gathered it is impossible to tell whether it is infected with the weevil or not. The seed looks perfect but a few weeks later may be riddled with holes. Just before the insect emerges a circular marking is seen on the shell of the seed, this is pushed outward and the weevil appears. In the seed of Acacia podalyriaefolia collected near Chino a short time after gathering fully fifty per cent hatched out weevils. The next year perhaps forty or fifty per cent of the remaining seed hatched out and still later another batch of probably fifteen or twenty per cent. The largest crop is generally the first year, though in some instances the first crop is light and the later ones heavier. In Acacia armata collected in Pasadena quite a large crop appeared the first year, the second year only a few, but the third year about ninety per cent of the remaining seed produced weevils.

Acacia baileyana from Santa Barbara for two years appeared to be absolutely free from the weevils, the third a number hatched out and a second crop the fourth year.

Acacia decurrens from Pasadena showed no weevil till the second and third seasons.

When the insect makes its way out of the seed it leaves quite a large cavity but does not always destroy its germinating power, if the hole happens to be some distance from the germ, it is still possible for the seed to grow. The method I have followed for separating the seed is to throw it into a pan of water; the hollow seeds float and are skimmed off, while the solid ones sink to the bottom.

Seed of Acacia melanoxylon (Black Acacia) collected near Orange produced weevils a few weeks after gathering. The seed was separated in the above way and the hollowed out seeds thrown on the ground, after a few weeks quantities of seedlings appeared showing that in a certain number the germ was not injured. This may be governed somewhat by the size of the seed. In Acacia armata of which the seed is very small practically all the inside was destroyed. In Acacia podalyriaefolia and A. elata many of the seeds harboured two of the insects.

Though this weevil appears to attack most species of Acacia in California I have never found it in seed of Acacia nerifolia (A. floribunda), or in A. latifolia. In the case of the former it may possibly be that the seed is so very flat there is not enough room for the insect to develop. This however cannot be said of the later in which the seed is plump and oval.

It has been suggested that the early flowering species are not so subject to the weevil as the late flowering ones. This however is not borne out by the facts. A. podalyriaefolia, blooming in January, was badly infected. A. dealbata and A. baileyana, flowering in February, were both infected, while A. latifolia blooming at the same time was not. A. mollissima and A. melanoxylon, both flowering in April and May, were also badly infected.

*This beetle was identified by Mr. H. C. Fall. The common pea and bean "weevils" are of the same genus.

LEWIS SWIFT.

Dr. Lewis Swift, a fellow and honorary member of this Academy, died on Sunday afternoon, January 5, 1913, at Marathon, N. Y., as a result of a paralytic stroke on New Year's day, at the age of ninety-two years.

He was born at Clarkson, N. Y., February 29, 1820. Was educated at Clarkson Academy; an honorary Ph. D., from Rochester, 1879. Director of the Warner Astronomical Observatory, at Rochester, N. Y., from 1886 to 1894, and the Lowe Observatory, Echo Mountain, Cal., 1894-1900. He received three gold medals from the Emperor of Austria, under the auspices of the Imperial Academy of Vienna, in as many successive years, for contributing most to astronomy. He also received the Lalande prize from the Paris Academy; the Mrs. Hannah Jackson gilt bronze medals in 1897; four bronze medals from the Pacific Astronomical Society, and other prizes. He was a member of the Pacific Astronomical Society, fellow Royal Astronomical Society, British Astronomical As-

sociation, etc. He discovered 14 comets and 1240 nebulæ as given in Cattell's American Men of Science, 1910; other reports not so reliable say 18 comets and 1300 nebulæ; he was also a student of shooting stars; solar eclipses; and intra-Mercurial planets.

Several years ago he was stricken blind, and forced to give up his work. Dr. Swift first came into prominence in 1862, when he discovered the comet which took his name. He went to Rochester, where he set up an observatory on Duff's cider mill.

Though in the hardware business at the time, he discovered a comet each year from 1877-1882. Some of the best work and discoveries in Science have been and are being made by men engaged in mercantile and other pursuits not related to that special study.

Dr. Swift was the author of "Simple Lessons in Astronomy."

DR. JOSEPH C. NEVIN

Joseph C. Nevin, a fellow of this Academy, died at his home in Los Angeles in May, 1913. He was born in Pittsburgh, Pennsylvania, January 6, 1835, where he spent his early life; later moving to New York, from which latter place he went, in 1859, to Canton, China, around the Cape, as a missionary among the Chinese; he continued in this capacity, with these people, in China and California, until too old and feeble to continue, retiring from active work in Los Angeles about 1901. In Canton, China, he became acquainted with the Henry F. Hance, English Vice-Consul, and botanist of renown. From Hance, Nevin received his interest and incentive to study botany. Nevin collected several hundred sheets of plants while at Canton which he later brought with him to California. Albert S. Bickmore, who was Director of the American Museum of Natural History, was then traveling and collecting in the East Indies, Philippines and China, and with Dr. Nevin he went 300 miles up the North River, finally separating and going to Shanghai, from whence he returned home to America; Nevin returning to Canton.

In 1878 Nevin left Canton, China, for Los Angeles, Calif., where he has remained, with only short trips from this city, still a worker among the Chinese. Los Angeles was then a small town of barely 9000 people, and the region which is now covered with buildings and pavements was his botanical collecting ground. He gathered an herbarium of about 2000 sheets, and these, together with his library, was presented to

Westminster College, New Wilmington, West Pennsylvania, about 1905.

During Nevin's residence in Los Angeles, he became acquainted with many of the prominent botanists of this country. He conducted Gray and Parry on trips in this vicinity, Laurel Canyon, Verdugo, etc., and could relate many pleasant incidents of what were surely inspiring walks and conversation. Farlow, the cryptogramic botanist of Harvard University, was also an early visitor to Los Angeles, whom Nevin associated with on botanical rambles. He knew and collected with most of the early California botanists: Lemmon (who was an odd fellow), Albert Kellogg, Dr. Behr, D. Cleveland, Orcutt, Mr. and Mrs. Brandegee, Parish, W. S. Lyon, Dr. Davidson, and others.

He visited Santa Catalina Island with W. S. Lyon, a local collector, who later went to Washington, and procured a lot of interesting plants, including **Gilia nevinii.** He made other excursions to Lang Station, Tehachapi, Fresno in the San Joaquin Valley; in the San Fernando Valley (Tujunga Wash) he first collected that peculiar and interesting shrub, **Berberis nevinii** Gray; and at Newhall he collected the white-woolly **Coleosanthus nevinii** Gray.

Dr. Nevin was one of the founders and an active member of this Academy, later being elected a Fellow. And he was a Corresponding Member of the California Academy in San Francisco. He received the degree of Ph. D. from Washington and Jefferson College, and LL.D. from Westminster College. He was interested all his life in the study of the topography of ancient Jerusalem, and concentrating his attention on it after retiring from the active work of the ministry among the Chinese in 1901; he completed a manuscript of 350 typewritten pages, with diagrams, etc., entitled, "The Topography of Ancient Jerusalem and the Temple."

Dr. Nevin was a thorough and complete master of the Chinese language, reading, writing and speaking it fluently; even better than the English language; he even admitted to his friends that he could no longer appreciate English idioms, but did appreciate the Chinese idioms!

Our interest in Nevin is chiefly botanical, and as long as lovers of the local flora meet with the peculiar shrub **Berberis nevinii** in the Tujunga Wash, or the composite, **Coleosanthus nevinii** on the dry foothills, his name and service to botany will remain fresh in our memories; and we will try to honor this pioneer student and collector in our field and herbarium work; the first resident naturalist in Los Angeles.

"That our remembrance, though unspoken,
May reach him where he lives."

Fordyce Grinnell, Jr.

TRANSACTIONS

The annual meeting and election of officers of the Academy was held on Thursday evening, June 5, 1913, at Christopher's, 551 South Broadway, Los Angeles, commencing with a sumptuous banquet from 6:30 to 8 o'clock, during which discussion of various subjects took place. There were about forty persons present, chiefly members of the Academy, and retiring President W. A. Spalding in the chair.

Past-president B. R. Baumgardt then gave a particularly interesting account of Wagner, and his significance and influence on the world; at the close the members rose in their places and drank the health of the speaker, in grape juice.

The reports of officers and chairmen of sections were then heard. Mr. R. L. Beardsley read the report of the secretary, Arthur B. Benton, who was unable to be present. Mr. S. J. Keese read his report of the treasurer, which showed the finances in good condition.

Mr. Wm. H. Knight, one of the founders of the Academy, three of whom were present, gave a very interesting account of the founding of the Academy, its early successes, struggles, trials and aspirations. The Academy in its twenty years of activity has accomplished more than might be surmised.

Vice-president A. Davidson then gave an account of the botanical work in Southern California and the numerous additions to the herbarium.

Vice-president Wm. L. Watts gave an account of the geological work, especially the petroleum deposits of the Southwest.

Chairman C. A. Whiting gave an account of the Biological Section, the most active section of all, this year, having held six meetings, with technical discussions of the subjects presented, and all well attended. Dr. Whiting also spoke of the early history of the Academy, which is always interesting.

Mr. Geo. W. Parsons gave an account of the valuable and useful work in placing sign boards on the desert; and gave some humorous digressions as change.

Mr. Ford A. Carpenter, local weather observer, gave an account of certain aero-dynamic work, in connection with the recently organized section.

Mr. F. Grinnell, Jr., read a short article on "An Ideal Academy," and showed plans for a proposed Academy building, prepared by Mr. Benton.

Dr. Hector Alliot, director of the Southwest Museum, spoke of the progress of that museum, and wished the Academy success in obtaining its new building, further saying that the Academy should become the greatest scientific society in the Southwest.

Mr. Frank S. Daggett, director of the County Museum building in Exposition Park, gave an account of the successful work accomplished there, and the retiring president spoke of the work of this museum, and the great help of the Academy in building up the collections.

After one of the most significent annual meetings ever held by the Academy, the meeting adjourned at 10 o'clock.

F. GRINNELL, JR.,
Acting Secretary.

SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

A meeting of the board of directors was held immediately following the banquet on Thursday evening, June 5, 1913.

Present: W. L. Watts, W. H. Knight, W. A. Spalding, G. W. Parsons, R. L. Beardsley and S. J. Keese, constituting a quorum. Mr. Spalding presided.

Officers for the ensuing year were elected as follows: A. B. Benton, president; C. L. Edwards, first vice-president; W. L. Watts, second vice-president; R. L. Beardsley, secretary; S. J. Keese, treasurer. Other directors: W. H. Knight, W. A. Spalding, G. W. Parsons, A. B. Ulrey, Anstruther Davidson, H. O. Collins.

It was decided to purchase an addressing machine at the cost of $12.50. Board adjourned.

Respectfully submitted,

ROBERT LEROY BEARDSLEY,
Secretary.

814 San Fernando Bldg.

BIOLOGICAL SECTION

November Meetings

Dr. Charles Lincoln Edwards on Sex-Chromosomes, with colored diagrams. Dr. Wm. A. Hilton of Pomona College, on The Tunicates, with blackboard drawings. At Christopher's.

January Meeting

Dr. Wm. A. Hilton of Pomona College on The Development of the Blood and Yolk Blood Vessels in Amphibia, with beautiful colored diagrams. Dr. C. A. Whiting showed some lantern slides of pathological, histological preparations. Polariscope demonstration. At Mr. Keese's home.

February Meeting

Dr. Wm. E. Ritter, of the Marine Laboratory at La Jolla, on The Marine Organisms off the Coast of Southern California, with lantern slides. Polariscope demonstration. At Mr. Keese's home.

March Meeting

Dr. C. O. Esterly of Occidental College on The Habits of the Copepods, diurnal and nocturnal migrations; with carefully prepared charts. At Dr. Petter's office.

April Meeting

Dr. Charles L. Edwards, on The Marine Laboratories of Europe, personal reminiscences. At the Normal School.

May Meeting

Mr. Grinnell on Sexual Dimorphism of Butterflies. Mr. Ernest DeKoven Leffingwell on his Alaskan explorations. Mr. Chas. E. Rilliet, on the Baldwin-Ziegler Polar Expedition. At Normal School.

The Botanical Section has this season been wholly occupied with the mounting of herbarium specimens for the museum. Our original collection, containing about 3000 specimens, has been gone over and

those destroyed by insects have been eliminated. On account of the lack of room and proper cabinets, a large portion of this collection was rendered useless.

A few enthusiastic members have come to our assistance and to the remnant we possessed the following donations have been received:

Miss Mohr, Los Angeles, 450 specimens, mostly northern species with some mounted European ferns.

Miss Alice Hutchinson, 140 specimens from Mt. Carmel and Yosemite.

Mrs. Trask, 105 specimens, Catalina and the islands.

Mr. Fordyce Grinnell, 200 specimens, Southern California.

Mr. and Mrs. Chadwick, Hollywood, 600 specimens from the Rocky Mountains, from Banff to the Yellowstone.

Mr. Parish, San Bernardino, 350 specimens, mostly from Southern California.

Mr. Theodore Payne, collection from San Bernardino Mountains, in course of mounting.

A. Davidson, 1500 specimens of British specimens and numerous specimens from Inyo county and Southern California.

Dr. Hasse, an almost complete set of the Lichens of California—a valuable collection.

T. PAYNE, Secretary.

SECRETARY'S REPORT

During the current year 1912-13 the Academy has met seven times, at each of which meetings it has been entertained by a lecture, the speakers on the several occasions being:

On June 5th, 1912, Professor E. A. Fath. Subject, "A Trip to a Star."

October 21st, 1912, Mr. G. G. Johnson. Subject, "The Panama Canal."

January 6th, 1913, Architect Arthur Burnett Benton. Subject, "The Franciscan Mission of Alta California."

February 6th, 1913, Dr. Gilbert Ellis Bailey. Subject, "The Methods of Burial from the Cave Dweller to Modern Times."

April 7th, 1913, Professor Daniel Trembly MacDougal. Subject, "Physical and Biological Features of American Deserts."

April 10th, 1913, Professor William L. Watts. Subject, "A Talk on Iceland."

May 2nd, 1913, Dr. Anstruther Davidson. Subject, "Brains and the Classes of People who produce them."

The directors met in special session on several occasions other than the regular meetings of the Academy.

At the August meeting, Mr. H. O. Collins announced that he was about leaving for a trip around the world, and therefore resigned his office as secretary. Mr. Arthur B. Benton was therefore elected secretary to fill the unexpired term.

I announce with deep regret the recent death, at Rome, Italy, of Mr. W. C. Patterson, a life member of the Academy.

The correspondence of the secretary's office is increasing each year and the exchange list is also growing rapidly, and promises to provide a valuable collection of pamphlets in the future.

ARTHUR B. BENTON,
Secretary.

A special meeting of the Southern California Academy of Sciences met on Tuesday evening, April 15, at the Polytechnic High School auditorium. About thirty gathered. Mr. Watts announced the un-

avoidable absence of Prof. Tower. Prof. Watts spoke on Iceland and its volcanoes, which proved very interesting to those present.

The Biological section of the Southern California Academy of Sciences met on Thursday evening, January 16, 1913, at the residence of Mr. S. J. Keese, 1509 Shatto street, Los Angeles. The chairman of the section, Dr. C. A. Whiting, presiding. The following persons were present: C. L. Edwards, C. S. Thompson, J. R. Haskins, Prospero Barrows, C. O. Esterly, W. H. Knight, W. A. Hilton, S. J. Keese, Mrs. Keese, Miss Elizabeth Beckford, Mrs. Wilson, and F. Grinnell, Jr.

Dr. Wm. A. Hilton, professor of Zoology in Pomona College, gave an interesting account of original work on the development of the blood and yolk blood vessels in the amphibia, illustrated with carefully prepared colored diagrams. The whole paper to be published later in the Journal of Morphology. In Amblystoma the mesoderm and that part which gives rise to the blood and blood vascular system arises from the mesodermal cells. In the eastern Salamander, which is transparent in the course of its development, and so can be studied superficially, which is not the case in Amblystone, the blood first appears in the center of the yolk-sac and gradually branches and connects with the main body of the animal. A separate vessel (colored blue) inside the body, gradually develops a parallel vein and cross-veins, called the ventral abdominal vein; was at first quite puzzling and interesting. It is homologous with the umbilical vein of other animal forms. The new point found was the development of the blood as seen in superficial study. There are lacunae or spaces before the vessels are developed. Discussions and questions.

Dr. C. A. Whiting showed a series of slides of histological subjects with the projection microscope, on the screen, mostly showing pathological conditions.

Mr. C. S. Thompson reported the capture of a new species of Salamander on Los Coronados Islands which he is soon to describe. He also showed some very fine photographs of these islands; and nesting sites of some birds.

Mr. Keese interested those present with the wonderful color display of crystal formation as seen with the polariscope.

Mrs. Keese and Misses Keese furnished light refreshments, which concluded an interesting and profitable evening.

Adjournment at 11 o'clock.

F. GRINNELL, JR.,
Acting Secretary.

The Biological Section of the Southern California Academy of Science met on Wednesday evening, February 26, at the residence of Mr. S. J. Keese, 1509 Shatto street, Los Angeles, with the following persons present: A. J. Petter, R. L. Beardsley, John Clark, S. T. Keese, F. Grinnell, Jr., L. H. Miller, C. O. Esterly, W. E. Ritter, Mr. and Mrs. E. R. Hoskins, Mrs. Sara L. Murray, A. B. Ulrey, F. B. Fitch, J. Z. Gilbert, W. A. Hilton, C. L. Edwards, Mr. Crandall, C. A. Brantlecht, Alex Martin, H. J. Ruberg, Prospero Barrows, Ralph Benton. Dr. C. A. Whiting, chairman of the section, presided, and introduced the speakers of the evening. Dr. Wm. E. Ritter, of the University of California Marine Laboratory at La Jolla, spoke on the subject, "The Pelagic Organisms off the Coast of Southern California," illustrating by lantern slides and a chart. An outline of his address is as follows:

The ocean is a vast storehouse of living things well adapted to a great variety of life, dividing itself sharply into different modes of life, three of which are, the shore life or littoral fauna, abyssal or

bottom life, and pelagic or swimming or floating life, the latter group is very rich in many small and transparent animals.

The ground is so vast that one has to confine himself to one side of the study, as in the study of Ornithology, Entomology, Mammalogy, Botany, etc., on land.

Twenty years ago the first attempt was made to study the life of the Pacific ocean. In 1901 he (in the interests of the University of California), made a reconnoissance of the coast, San Francisco Bay, Monterey Bay, and finally San Pedro, through some local friends. Then San Diego was examined, and he became convinced that these southern waters were the best. From the first the station specialized on the floating material as being less studied.

The lantern slides represented snaps of the coast, the rocky topography of the beach, and the station buildings and their equipment.

Slides of a large Oscidian were shown, and also the following: Copepods (the most important fishfood of the marine animals), other copepods; a chaetognath (Mr. Michael of the station is making a special study of these worms); various forms of Peridinidae, which, like the land plants, are well provided with food material for animals. The "Alexander Agassiz" being launched and at work was shown on the screen, with equipment for capturing small animals including the Kofoid closing net weighing 200 to 300 pounds; 0.7% formaldehyde is used for preservation.

Three hundred and twenty-eight species have been described from the beginning, and 900 species reidentified; 44 new species of unicellular organisms. Esterly has described 79 new species of crustacea and recorded 131 species; three new species of fish. What has been done is probably only a fraction of the whole, but it serves as a basis for further work.

They then dwelt on the distribution of species and the probable causes which lead to this and their rarity or profusion. We wish to know the bionomics of the organisms. Time of day, depth and light have a great deal to do with this. No two species have their distribution exactly the same level. Light and food are controlling factors in reactions. There were questions and discussions by Edwards, Esterly, Whiting, Keese, and others, which were very suggestive. Edwards told of variation in Synapta.

To conclude a profitable and interesting evening, Mr. Keese showed crystal formation by means of the polariscope.

Meeting adjourned at 11 o'clock.

F. GRINNELL, JR.,
Acting Secretary.

The Biological section of the Academy met on Thursday evening, March 20, 1913, in the office of Dr. A. J. Petters, 202 Pantages building, South Broadway, Los Angeles, Dr. C. A. Whiting, chairman, presiding. The following persons were present: J. C. Gomber, H. Gray, C. A. Whiting, C. O. Esterly, A. J. Petters, A. B. Ulrey, F. Grinnell, Jr., Prospers Barrows, H. H. Newcomb, John Clark, R. L. Beardsley, J. Z. Gilbert, G. W. Schlichten, Jr., Mr. and Mrs. Fred Burlew, C. D. Foster. Meeting called to order at 8 o'clock.

Dr. C. O. Esterly of Occidental College gave results of original work on the habits of the Copepods, carried on at the Marine Laboratory at La Jolla. The Copepods, or water-fleas, are very abundant everywhere and provide food for many animals, including whales. The Copepods for this study were collected in special net "hauls"; there were studied 680 bottles of specimens and about 225,000 individuals counted to get the results given in the talk. Six genera and nineteen speces were worked on. There were found to be more Copepods from 8-12 p. m. at the ocean surface; all records in June and July.

The average abundance was graphically shown by means of tables of figures. There was what might be termed a positive and negative heliotropism; but the causes are hardly known. There is a diurnal migration; away from the surface during the day and towards the surface in the evening. Most migrations are vertical; but a few horizontal ones are recorded, but are not explanable. Six species do not come above 100 fathoms except at night. All the work done shows that there is a continual oscillation of these organisms.

There was considerable discussion, especially by Prof. Ulrey, Dr. Whiting and Mr. Gilbert, and questions and suggestions offered by most persons present.

Meeting adjorned at 9:15.

F. GRINNELL, JR.,
Acting Secretary.

The Biological Section of the Southern California Academy of Sciences met on Tuesday evening, April 8, at the library of the State Normal School, Los Angeles. The meeting was called to order by the chairman of the section, Dr. C. A. Whiting, at 8 o'clock. Fifteen persons were present.

Dr. Charles Lincoln Edwards spoke on The Biological Stations of Kristineberg, Sweden; Naples, Italy; and Vienna, Austria. He described the organization of each, its equipment, the personalities of the directors, and the general work. Dr. Edwards spent some time at each of these stations, several years ago, working chiefly on the Holothuriens, and gave several little incidents of his residence at these places. He also spoke of his acquaintance with Rudolph Leuckart at Leipzig. The meeting adjourned at 9:15.

F. GRINNELL,JR.
Acting Secretary.

The Biological Section of the Southern California Academy of Sciences met on Thursday evening, May 15, 1913, in the library of the State Normal School, Los Angeles. Dr. C. A. Whiting, chairman, presiding, and a good attendance. Among those present were: C. A. Whiting, C. L. Edwards, C. O. Esterly, J. Frank Morris, S. J. Keese, R. L. Beardsley, C. E. Rilliet, E. D. Leffingwell, Karl Hummel, C. S. Clarke, Richard Ballerino, E. K. Head, G. Ogborn, Miss Helen M. Hubbs, Miss L. Hahn, and F. Grinnell, Jr.

Mr. F. Grinnell, Jr., read a paper on Sexual Variation of Butterflies, reviewing some recent literature on the subject by different men in various parts of the world, and illustrating certain points with several boxes of specimens. Particular attention was directed to the significant variation of the Dog's Head Butterfly, **Colias eurydice** and the Eastern **Colias caesonia.**

Mr. Ernest De Koven Leffingwell, the well-known Arctic explorer, gave a very interesting account of the topography, geology and natural history of the northern part of Alaska, illustrating his remarks with a map.

Mr. Chas. E. Rilliet, a member of the Baldwin-Ziegler polar expedition, with Mr. Leffingwell, related some experiences with this expedition which were highly instructive and sometimes amusing.

Dr. C. L. Edwards moved that a vote of thanks be extended to Mr. Leffingwell and Mr. Rilliet for their very valuable talks, which was seconded by Mr. Grinnell and unanimously agreed to by all present.

Dr. Whiting told of the value and importance of the establishment

of the Popular Science Monthly in spreading the Darwinian ideas of evolution.

The meeting adjourned at 10 o'clock.

F. GRINNELL, JR.,
Acting Secretary.

The Astronomical section of the Academy met on Friday evening, February 21, 1913, at the residence of Mr. S. J. Keese, 1509 Shatto street, Los Angeles. In the absence of Chairman Knight (on account of illness) Mr. Keese opened the meeting and introduced the speaker of the evening. Mr. Harold B. Babcock of the Mt. Wilson Solar Observatory, who spoke on the subject, "The Laboratory Side of Some Problems in Astronomy"; with some applications of the Zeeman effect. He explained the Zeeman effect by means of blackboard illustrations, and then showed the application in a beautiful series of lantern slide photographs of spectra, pointing out the Zeeman effect in each. These were followed by some slides showing various nebulae and star clusters, including the interesting nebular whorls or vartices. Mr. Babcock told of the general organizations of the laboratory in Pasadena; the Mt. Wilson observatory was one of the first in the world to have a laboratory in connection with the observatory. Views of the buildings on Mt. Wilson were shown as well as the apparatus in the Pasadena laboratory, which was explained.

Mr. Keese showed crystal formation with the aid of the polariscope, which was briefly explained by Mr. Babcock.

After light refreshments served by Mrs. Keese and daughters, the meeting adjourned at 10:30.

F. GRINNELL, JR.,
Acting Secretary.

The Astronomical section of the Southern California Academy of Sciences met in the library of the State Normal School, Los Angeles, on Friday evening, January 17, 1913, at 7:45 o'clock. Chairman Wm. H. Knight presided. A large number were present, among them being the following who were noted and registered: Melville Dozier, C. A. Whiting, S. K. Keese, John Frederick, Wm. Read, J. M. McLeish, Tom Smith, Prospero Barrows, H. A. Prince, John Clark (applying for membership), Dr. A. Gosdess (of the Keeley Institute of Philadelphia), H. M. Bishop, Abbie M. White, Thos. DeWitt (of the St. Louis Academy of Science), Arthur J. Mack, Phillip A. Bettens, N. J. Bradway, Mr. and Mrs. H. J. Darton, R. L. Beardsley, W. H. Knight, F. Grinnell, G. Wharton, James and Chas. E. St. John.

With appropriate remarks Chairman Knight introduced the first speaker of the evening, Dr. St. John, of the Mt. Wilson Solar Observatory, who spoke on the subject, "The Distribution of the Elements in the Solar Atmosphere. The discourse was strictly technical, being results of recent original work, partly still in progress, and was listened to with close attention by those present. The speaker illustrated his remark with blackboard diagrams, figures, etc., photographs of the sun showing the "spots," and plates of the spectra of the sun spots. A few points may be brieflystated. Evershed in India was the first man to work on this problem. Dr. St. John studied the "spots" when they were on the side of the sun; takes the spectra of one side of the spots, then the other side, and places these together. Thn he explained the lines of the spectum; this is very expensive work and takes a long time to measure these lines, and an accumulatton of considerable data to get seemingly small results. By the amount of the displacement of these lines, it can be learned how fast the substances or elements are moving in or out of a spot. The iron vapor flows

exceeding fast out of the spots, 150 miles a minute. Different elements are seen to go in a spot from what goes out. The action of these spots are what may be turned cyclones and this could be seen in the photo of the sun shown. The different elements give different displacements of the lines, and consequently show the strength; which was illustrated in detail by figures, etc.

Calcium vapor rises 24,000 kilometres, or 15,000 miles, increasing from a pressure of x10 to 0. As on the earth, it was shown that the heavy elements are at the surface of the sun, and the lighter further up. Hydrogen is found at the surface of the earth, but a certain distance no oxygen. An Edinburgh student has confirmed some of St. John's conclusions.

The special problem to solve is whether three little lines in the red of the spectum are oxygen; and it is hoped to solve this some day. Dr. St. John explained the operation of the spectro heliograph on Mt. Wilson, by which most of these observations are made. Questions and a short discussion followed.

Dr. George W. James was the next speaker, who spoke on Recollections of the late Dr. Lewis Swift, former directors of the Lowe Observatory, Echo Mountain. Dr. James was very intimate with both Dr. Swift and Prof. Lowe and his talk was full of interesting anecdote; he will publish accounts of these two men in "Out West," of which he is the editor.

Dr. James spoke of pure and applied science, which was to the point. Swift was devoted to pure science and Lowe to applied science, though not particularly materialistic. The pure scientist is a man of imagination, and such men are really necessary to a commercialistic community.

Mr. Knight announced a meeting of the Academy on Thursday evening, February 6.

Mr. Tom P. Smith announced the next meeting of the new astronomical club at the L. A. High School.

Adjournment at 10 o'clock.

F. GRINNELL, JR.,
Acting Secretary.

The Entomological Club met on Thursday evening, February 27, 1913, at the residence of Victor L. Clemence, 247 E. Green street, Pasadena, with the following men present: V. L. Clemence, H. H. Newcomb, H. C. Fall, W. Bollerman, A. G. Smith, Foster Daniels, and F. Grinnell, Jr.

Mr. H. H. Newcomb read some newspaper clippings concerning various topic of Entomology, mostly of a humorous character; he exhibited a copy of Denton's Butterflies, which contain the direct impression of the wings and conserving the true color; and made a suggestion about the advantages to be gained by a combination of Entomological journals, of which there are too many.

Mr. Grinnell read a more or less lengthy correspondence between J. M. Aldrich and C. W. Stiles, and between Aldrich and E. P. Felt concerning certain questions of Entomological nomenclature, which provoked considerable discussion by those present.

Informal discussion on various topics. Entomological and non-Entomological, was enthusiastically engaged in, and after the serving of light refreshments the meeting adjourned at 10 o'clock.

F. GRINNELL, JR.,
Acting Secretary.

The Zoological Section of the Southern California Academy of Sciences met on Friday evening at the residence of Mr. and Mrs. J.

O. Beebe, 439 W. 54th street, Los Angeles, April 25. Chairman J. Z. Gilbert, presiding.

Mr. J. O. Beebe gave a very interesting and instructive talk on Crinoids, of which he has the most important collection outside of the Museum of Comparative Zoology at Harvard, and the Smithsonian. Mr. Beebe collected a great many of those in the last named institutions. By means of models he showed the evolution of the Crinoids from the simplest forms up to the present starfish. Wachsmuth and Springer are the leading authorities on these nearly extinct animals, and he showed their large and expensive work. There were many questions and answers in a very informal way which added to the pleasure of the talk.

Mr. B. Burton, a mining engineer, gave an account of the finding and excavation of prehistoric animals in Utah, Wyoming and other Rocky Mountain states.

The following men were present: F. C. Clark, J. O. Beebe, H. B. Dixon, J. Z. Gilbert, Wm. H. Knight, H. H. Newcomb, R. L. Beardsley, B. Burton, John Clark and F. Grinnell, Jr.

The meeting adjourned at 10:30.

F. GRINNELL, JR.,
Acting Secretary.

On Thursday evening, June 12, a natural history club for boys was organized at the home of Rutherford Moore, 2242 Hobart Boulevard, Los Angeles. The following boys were present: Aten Lytle, George Miller, Walter Cline, Frank P. Alexander, Donuil Hillis, Rutherford Moore, Aubrey Eastham, Jack Phillips, Clifford Grant, James F. Moore, Charles Parker, James Cuzner, Ralph Church, Harold Grieve and F. Grinnell, Jr., from whom a president, vice-president, secretary and treasurer were chosen. The name Lorquin Natural History Club was chosen, in memory of the first collector of Californian insects and plants in 1849. It was decided to hold meetings on the first Fridays of each month, and frequent field excursions. The first field trip was on Saturday, the 14th of June, to the Ballona Creek region west of the city, where a lot of specimens were collected. In a few years this club, and others, will provide some real **active** members for our Academy.

Mr. Fordyce Grinnell, Jr.

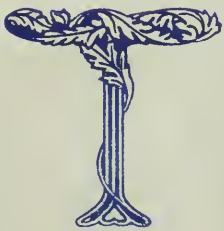
Dear Sir: Your article on Eugonia Californica in the last Southern California Academy Bulletin leads me to write concerning the wide devastation of Ceanothus Cordifolius by this insect in the southern Sierra Nevada in 1911. In August of that year I was traveling through the Kaweah and Tule river regions on a botanical expedition. The defoliation was most marked and of widest extent (occuring for several miles) on the South Fork Kaweah at 6500 to 7500 feet altitude. Large areas of the shrubs did not display a single leaf. The denudation was almost entirely confined to open sunny slopes. Colonies in shade of forest or on north slopes so sharp as to be largely protected from the sun, were not affected. The forest was mainly mixed Abies concolor- and magnifica.

Yours very truly,
WILLIS L. JEPSON.

BULLETIN

OF THE

SOUTHERN CALIFORNIA ACADEMY *of* SCIENCES



LOS ANGELES, CALIFORNIA, U. S. A.
JANUARY, 1914

Vol. XIII January, 1914 No. 1

BULLETIN

OF THE

Southern California Academy of Sciences

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Southern California Academy of Sciences

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THE TECATE CYPRESS—Parish.

FLUCTUATIONS FROM THE NORMAL TEMPERATURE AND PRECIPITATION AT LOS ANGELES, CALIFORNIA, DURING THE YEAR NINETEEN THIRTEEN.

By Ford A. Carpenter, LL. D.,
Local Forecaster, U. S. Weather Bureau.

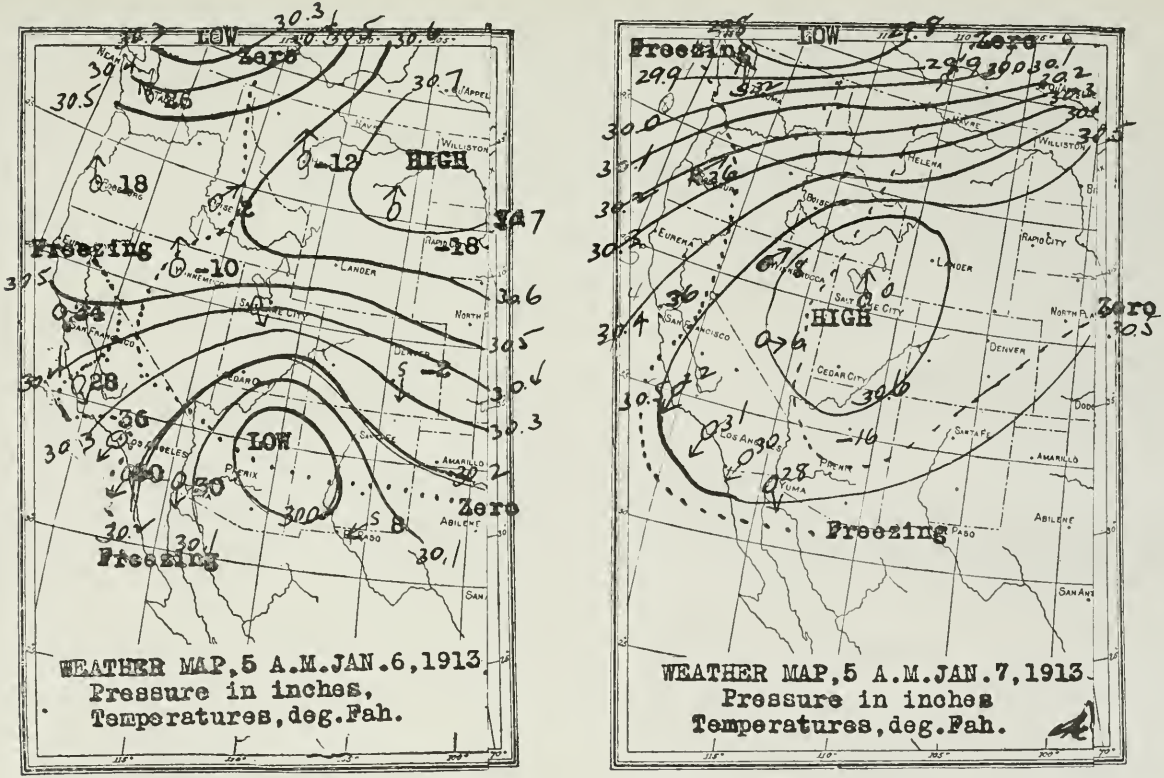
The year 1913 will go down in the meteorological history of the United States as one long to be remembered. Many temperature and rainfall records were equalled and exceeded in Southern California, and especially in Los Angeles and vicinity. The cause and character of the cold weather of January, the phenomenally heavy rainfall in February, and the high temperatures in September, all form interesting topics for study. These wide departures from the normal suggest that there may be truth in the oft-repeated assertion that there is a change in the climate, so at the close of this paper will be found the author's views on the stability of the climate.

Taking up the three phases of unusual meteorological departures from the normal chronologically, the first to be considered will be the extraordinarily low temperatures at the beginning of the year 1913.

The January Cold-Wave.

The unusually cold weather of the first week in January, 1913, established new temperature records in nearly all portions of California. In the citrus districts of Southern California it will be remembered chiefly because of the damaging effect of the frost. From a close study of weather conditions as shown by plant growth, horticulturalists as well as meteorologists are convinced that the low temperatures in Southern California on January 5, 6 and 7 have not been equalled in some portions of this district for over a century. For example, the century-old cactus hedge, planted by the early mission fathers, at San Jacinto, California, was destroyed by the cold weather in January.

This portion of the Pacific coast is remarkably free from atmospheric conditions which bring cold-waves. This is not true of the region to the south and east, as a study of the temperature records of Texas, Louisiana, Mississippi and Florida, shows. The accompanying weather maps for January 6th and 7th, show the formation and growth of remarkable aerial eddies and resultant temperatures. On the morning of the seventh it will be observed that the dominating high area produced zero temperatures far south into Arizona and dan-



Weather Maps of January 6 and 7, 1913, showing distribution of the Areas of High and Low Barometric Pressure and Resulting Winds and Isotherms.

gerously close to Southern California. There are unconfirmed reports of zero temperatures in the eastern and far southern portions of this district. Weather Bureau temperatures 10 degrees below freezing were registered at 5 A. M. of the 7th at San Luis Obispo, on the coast, just south of Point Conception.

The Heavy Rain in February.

The causes which led up to the heavy rain in Los Angeles on February 24, 25 and 26 were both general and specific. By general, is meant the geographical distribution of atmospheric pressure on the Pacific Coast and the region west of the Mississippi River, and specifically, local as affecting the San Gabriel valley.

The records of Southern California stations show that during dry seasons, i. e., seasons with abnormally deficient precipitation, downpours in January, February or March are comparatively common, with their relative frequency like this:

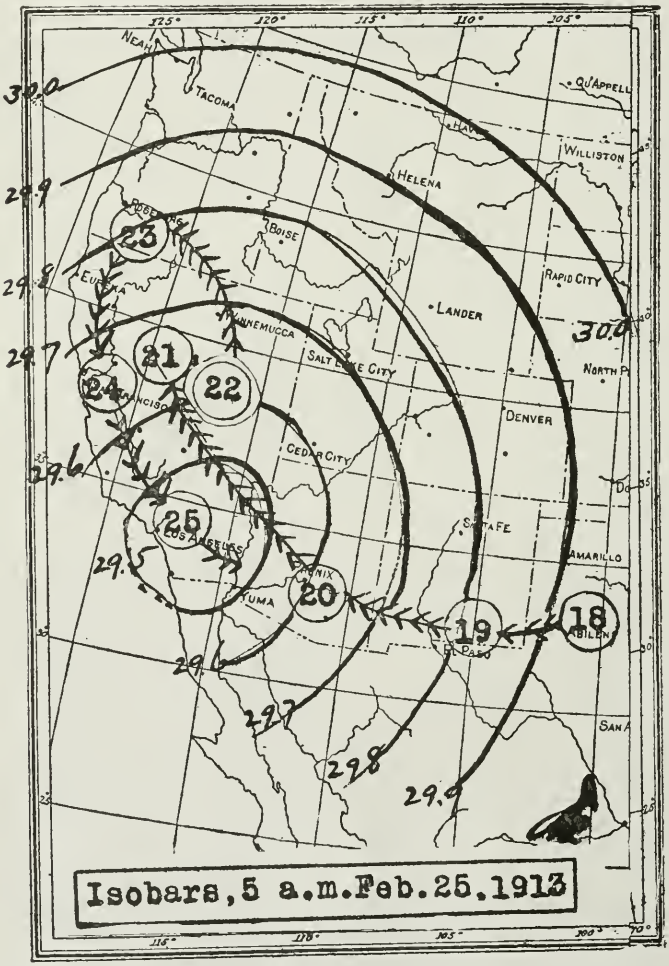
January, 1,
February, 3,
March, 2.

The reason is this: The difference between a season of deficient rainfall and excessive or normal rainfall is whether or not the areas of low pressure (which normally move in and strike the Coast about the latitude of the Columbia River) take a course a little south of east and move slowly on their path to the Great Lakes, or whether these barometric depressions are blocked by great areas of high pressure that drift down from the British Provinces and envelop the western states. The general blocking of the normal movement gives long periods of dry, cool and clear weather to California, and especially to Southern California.

During seasons of deficient precipitation the high areas prevent the general movement of the regular northern storms. Owing to the crests of these high areas being north of this district, most frequently over Nevada and Utah, a solid front is presented to the west but is weakest towards the south. To this spot a small, but frequently well-defined, low area breaks in and enters the southern coast.

Such a depression was first observed over Southern Arizona on the 19th, it having probably entered the Sonora region on the 18th. This storm moved rapidly up the valley on the 20th and on the 21st rain began to fall in Los Angeles, accompanied by a northerly wind, thus indicating the southern and consequently abnormal origin of the storm. The storm continued its northerly course, but dipped southerly on the 22d, which day was clear and bright all day, but with

southerly winds. The storm moved rapidly into Oregon, traversing six hundred miles in twenty-four hours, then recurved and started southerly again, moving 400 miles in twelve hours. During the night of the 24th heavy rain began, and on the 25th 4.80 inches fell at Los Angeles; proportion-

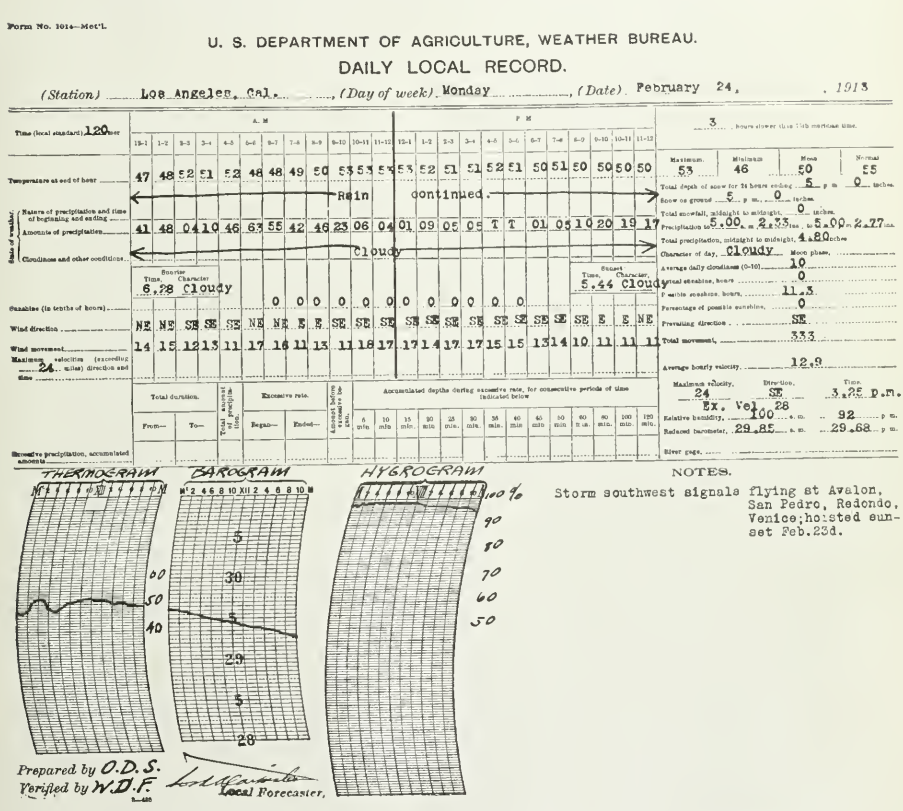


Weather Map showlng Arrangement of Isobars at 5 A. M. Feb. 25, 1913, Progression of Storm shown by Feathered Lines; Date and Location of Storm by Circled Figures.

ately heavy rain fell at Santa Barbara and still heavier rain occurred at Pasadena. The storm then took the normal direction eastward and passed out of range as affecting the weather in Southern California.

The reason that the storm's actions were confined to Southern California was the fact that an immense area of high pressure to the eastward acted as a mighty bolster. This high area also provided masses of cold air thousands of miles in area to affect, by its immensity, the nearly saturated air of this district.

The reasons why the region about Los Angeles and Pasadena and neighboring towns received much heavier rainfall


Form No. 1014—Met'l.

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU.

DAILY LOCAL RECORD.

(Station) Los Angeles, Cal. (Day of week) Monday (Date) February 24, 1913

Rain continued.

Cloudy

THERMOGRAM

BAROGRAM

HYGROGRAM

NOTES.

Storm southwest signals flying at Avalon, San Pedro, Redondo, Venice; hoisted sunset Feb. 23d.

Prepared by O.D.S.
Verified by W.D.F.

Local Forecaster.

Meteorological conditions accompanying the heavy rain of Feb. 24, 1913. (Copy of the daily local record for that date.)

than Redlands or Riverside is, first, because the storm's track left these latter places on the dry side of the area of low pressure; second, because the region about Los Angeles was enveloped in an atmosphere having in possession and recourse to, a great amount of moist air necessary to the production of rain. This was not the case at Redlands or Riverside as the relative humidity at these places was low and the air dry and

not disposed to moisture. That the mountains to the north and northwest of Los Angeles contributed to the deflection of air currents upwards, tending to increase the convectional currents, is proven by the fact that Monrovia, Glendora, and other nearby towns reported heavier rainfall than either Pasadena or Los Angeles.

To summarize: The cause of the heavy rain in Los Angeles was generally the blocking of aerial eddies westerly, permitting the entrance of a southerly storm and specifically the recurving of the path of the low area and the configuration of the region about the San Gabriel River.

*The September Hot Wave.

On September 17, 80 degrees was the highest minimum temperature ever recorded in Los Angeles, and the highest temperature, 108 degrees, on that day was within 1 degree of the absolute maximum for the station, 109 degrees on July 25, 1891. That such conditions are uncommon may be gained from the fact that this temperature was 26 degrees higher than the mean daily maximum for the month from 37 years' record at this station. Otherwise September was a typical month, the mean highest temperature being only 2 degrees above the daily normal maximum.

The cause of this hot spell, like all instances of temperatures above 90 degrees in this portion of Southern California, was a well-defined "norther" condition brought about by pressure distribution typical of such phenomena.

On September 15 the barometric pressure was high over the northwest and low in the southwest. While the low area remained stationary for many days, the high area progressed in a southeasterly direction. The greatest difference in pressure was coincident with the warmest day, when the weather map showed a gradient of a tenth of an inch in barometric pressure to the hundred miles on an east and west line.

The effect of this pressure distribution on the weather in the coast districts of Southern California was to give that region the driest and warmest day on record. Previous records were broken at surrounding stations, notably that of San Diego, which has the longest unbroken series of observations in this section. At that station the thermometer rose 9 degrees higher than ever before recorded, and 33 degrees above the mean daily maximum temperature of the month.

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* "Monthly Weather Review." 1913. Vol. XLI. Pp. 1470-1471.

Monthly and Annual Distribution of Temperatures of 100° and Over at Los Angeles, Cal.

YEAR	April	May	June	July	Aug.	Sept.	Oct.	Total
1877								0
1878						103		1
1879			a104			a101		4
1880								0
1881					100	102		2
1882						100		1
1883		100	100			bf104		6
1884					b102			2
1885					ce106	108	102	5
1886								0
1887			100					1
1888								0
1889						103		1
1890			c105					2
1891				ad109		100		4
1892								0
1893								0
1894								0
1895			100					1
1896		103						1
1897								0
1898								0
1899							100	1
1900								0
1901								0
1902								0
1903								0
1904								0
1905					101			1
1906						105		1
1907				ac103				3
1908								0
1909					101	c103		3
1910	100							1
1911								0
1912						100		1
1913						108		1
Total	1	2	7	6	8	17	2	43

References: (a) also 100; (b) also 101; (c) also 102; (d) also 103; (e) also 104; (f) 102 twice.

Month with maximum number, September 17

Year with maximum number, 1883 6

Average number per year (over) 1

Remarks: The absolute highest temperature, 109 degrees, was registered on July 25, 1891.

The Los Angeles thermogram and hygrogram of the four-day period presents an excellent example of the relationship between temperature and moisture in Southern California during days when the thermometer rises above 90 degrees. The trace sheets of the thermograph and hygrograph show that the day preceding and following the hot day were normal September days with moderately high temperatures, 99 and 90 degrees, and nearly normal humidities, 66 per cent. and 65 per cent. At 1:30 P. M. on September 17, the time of the highest temperature of 108 degrees, the relative humidity was 4 per cent. as determined by whirled psychrometer observations.

Growers of vegetables and tender plants suffered loss by the extreme dryness, and some of the walnut groves sustained damage. The physical effect of the hot and dry air was not detrimental to the health or business activities of the community. There was an absence of prostration cases from the hospital records and business progressed without interruption. Owing to the extreme dryness of the air animals did not suffer from the heat except rabbits, many of them dying from the unusual conditions. Incidentally there was considerable financial loss occasioned by forest and city fires. On the day of the greatest heat the city fire department responded to 21 fires, which necessitated the use of about 75 million gallons of water, equaling the amount used for domestic purposes by the city on a normal day.

Is the Climate Changing?

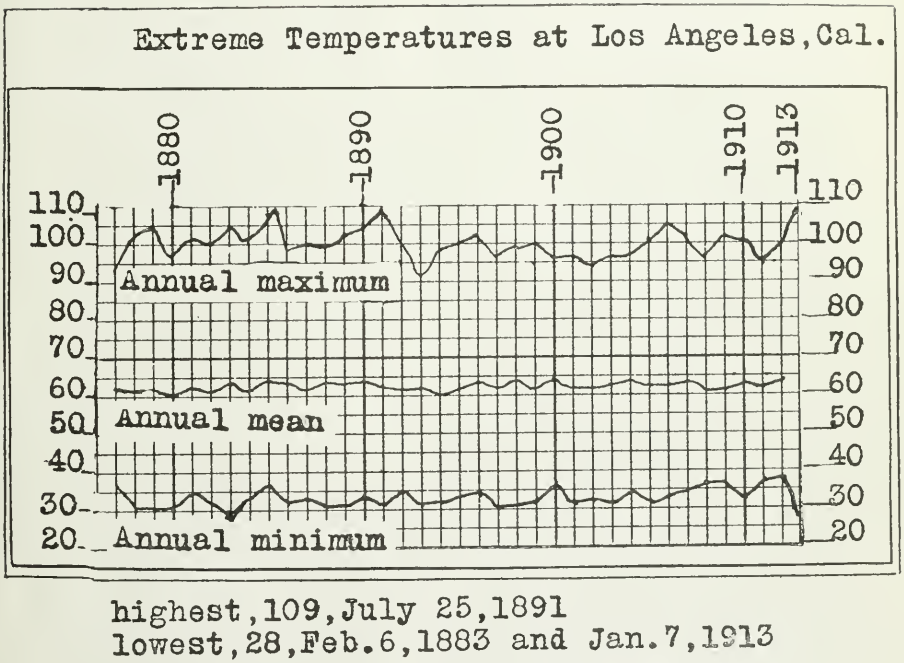
A perusal of the foregoing account of the weather extremes in Southern California during the present year may well stimulate the popular inquiry, "Is the climate changing?" While it is true that here in Los Angeles we have equaled the lowest temperature ever known as well as the highest (within one degree) ever experienced, also the hottest night on record in this locality, and registered the heaviest twenty-four-hour rainfall, all since the first of the year, this does not indicate a change in the general equability of local meteorological conditions.

There are fluctuations from a normal, both in temperature and rainfall, but these departures are neither periodic nor cumulative. It is readily seen from the accompanying chart showing profiles of maximum, average and minimum temperatures at Los Angeles for over a generation that there is no general diminution or increase in temperature. In fact, as regards mean temperature it will be noticed that the temperature varies only a few degrees from year to year. The warmest year in Los Angeles was that of 1877, with an aver-

age temperatuer of 66 degrees, and the coldest, 60 degrees, in 1880 and in 1894.

No General Change Recorded in a Generation.

In a recent book* the author discussed the stability of the climate and said that an examination of sixty-three years'



Profile of Mean and Extreme Temperatures at Los Angeles, Cal. Record began 1877; data from recording instruments.

record at San Diego (which has one of the longest uninterrupted climatic records in the west) showed no general increase or decrease in either temperature or rainfall.

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*"Climate and Weather of San Diego, California." 1913. Pp. 33-34.

That the climate is changing cannot be denied; but this change is covering thousands of years, and it is not compassed by the little span of recorded history. Though thousands of years have elapsed since the ice-sheet began to retreat, we have to go but a few hundred miles to the Yosemite National Park to see regions not yet beyond the glacial conditions of that era.

Non-Periodic Fluctuations Occur.

Climates change from age to age, but the systematic record of past events is limited to so short a space of time that no change has been observed, and no general increase or decrease in either temperature or rainfall has been recorded.

It seems a far cry back to the golden days of '49, when a rain gage was set up in the oldest California Mission at San Diego; but how many hundred times fifty years have elapsed since the days when the lava met the sea at Point of Rocks at the Mexican boundary? One is a historic period and the other is a geologic epoch.

THE TECATE CYPRESS.

S. B. Parish.

The region along the Mexican boundary to the east of San Diego is a complex of rugged mountains, the altitude of whose highest summits seldom exceeds 500 feet. Deep and narrow gorges penetrate them, carrying the drainage of the scanty rainfall to the Tia Juana river, but for the greater part of the year waterless, except in the few places where a feeble flow maintains a precarious existence through the summer, and suffices to irrigate an occasional pocket or little vale, affording space for a garden spot or a few farmsteads.

The country rock is granitic, and the red or yellow soil, thin except in the little flats, is the resultant of its more or less complete weathering and disintegration. Blocks and fragments of all sizes and shapes lie scattered over the surface, and cracked ledges project, especially toward the summits, which are mostly capped with naked rocks. Elsewhere a shaggy chaparral clothes the hills, and renders it difficult to explore them. A thin file of Cottonwoods, Willows and Sycamores follows the beds of the larger drainage courses, and on their outer margins here and there a stunted Oak appears. All are of less than the normal size to which they attain under more favorable conditions. They obstruct rather than shade the channels which they border. Hard as are the conditions which here confront plant life, they have developed an abundant, varied and interesting flora, inviting alike to the ecologist and to the taxonomist.

An excellent road winds through these mountains from the city of San Diego to Mountain Springs, where it drops down to the Colorado desert, and so goes on to Imperial Valley, an artificial oasis in the Salton Sink. Descending by loops and curves the abrupt slope of one of these mountains, the road crosses Cottonwood Creek, and at once begins the equally tortuous ascent of the northern side of Mount Tecate. This crossing, designated on maps as Cottonwood Station, is 35 miles east of San Diego, and has an altitude of 900 feet above sea level. It consists of a single house, provided with a watering trough and a gasoline tank for the accommodation of the two classes of travel which pass over this road.

Mount Tecate is 4,000 feet in altitude, and is exactly on the dividing line between the United States and Mexico, two of the boundary monuments being situate on its summit. To the botanist it is of interest as one of two isolated and limited habitats of a Cypress, a genus which, although well represented in the central and northern parts of the state, is

otherwise unknown south of the Santa Lucia mountains, nor in other directions nearer than the mountains of Arizona, so that it is separated by hundreds of miles from any congeneric species.

Following the road, as it leaves Cottonwood Station and climbs the Potrero Grade up the flank of Tecate, the first Cypresses are seen about a mile and a half above the crossing, and at an altitude of about 1,100 feet. They are few in number, and are scattered among the Oaks and Sycamores which scantily fringe the ravine of Potrero Creek. Presently they appear on the right among the rocks filling the bottoms of the steep and narrow gulches which seam the side of Tecate. They are scattered here at intervals, mostly in small clusters, and do not in the least tend to extend up the banks.

The whole side of the mountain is densely overgrown with a mixed chaparral, in which no one species predominates. Into its composition enter **Rhus ovata, Arctostaphylos bicolor, Prunus ilicifolia, Rhamnus ilicifolia, Adenostoma fasciculatum, Heteromeles arbutifolia, Cercocarpus betulifolius, Clematis pauciflora, Hazardia squarrosa, Ceanothus** sp. and **Lonicera** sp. **Quercus dumosa,** which at somewhat higher altitudes is often almost the exclusive chaparral shrub, is very sparingly represented, but by individuals presenting the diverse forms of leaf and acorn common in this species. The subordinate vegetation includes **Helianthemum scoparium, Artemesia californica, Diplacus puniceus, Gutierrezia sarothræ, Salvia californica, Dicentra chrysantha, Convolvulus occidentalis, Gnaphalium californicum, Stephanomeria virgata** and a variety of annual grasses and other herbs, unrecognized in their dry and broken remains.

As it grows in these gulches the Cypress is a slender tree, at most 20 feet in height, but all the individuals, even the smaller, have the appearance of small trees rather than of large shrubs. They present an aspect of adolescent vigor, but no seedlings, or very young specimens, were seen, nor, on the other hand, any which might be termed aged, nor were there remains of old trees to be found. But I am informed by Mr. Frank Stephens that on the summit of Tecate there are several hundred trees, some of which appear of great age. They are bent and scraggy, as is usual on windswept heights, but while they do not exceed 25 feet in height they are said to have trunks two and three feet in diameter. It was with regret that I found myself unable to visit these trees, but the summit of Tecate is practically inaccessible from the American side, by reason of its steepness, and of the dense chaparral which covers it. On the Mexican side it may be reached by a trail from the hamlet of Tecate, but there are political as well as physical obstacles in the way of this ascent.

The average circumference of eleven of the largest trees growing in the gulches visited was 11 inches, the extremes being 15 and 7 inches. The naked trunk is short, as the limbs begin not far from the ground, and the limbs themselves are rather sparse, seldom over eight feet long, spreading, or somewhat ascending, but not in the least pendulous. The bark is smooth and shining, free from resin or fibers, of a mahogany-brown color, with lighter mottlings, caused by the scaling off of thin flakes. Foliage bright green; mature leaves broadly triangular, 1 mm. wide; dorsal pits minute or mostly wanting, without lateral furrows. Staminate aments numerous, 3-4 mm. long, 2 mm. thick; anthers 4 to each scale. Cones globose, 1.5-2 cm. in diameter, dark gray, densely clustered, or rarely solitary; peduncles 1-5 cm. long; scales 6 (rarely 4-5), quadrate, 1.5 cm. in diameter, rugose, the umbo blunt or having a small upturned scale-like point; seeds about 70 in a cone, 4 by 3 mm., narrowly margined, minutely papillate, brown, and at base marked with a short white line. At the time of my visit, October 13, a few trees were beginning to discharge pollen, and most were nearly ready to do so, but no pistillate catkins were noted. The seed of the previous year was mature, but the cones showed no tendency to open. They were confined almost entirely to the larger trees.

A second station for this Cypress is on the north face of a mountain between Descanso and Pine Valley, about 20 miles in an air line from Tecate, and 45 from San Diego. So far as can be learned from those best acquainted with the region these two stations are the only ones in any part of San Diego county, or of Lower California.

Although the existence of this Cypress has been long known, there has been little definite information concerning it, and its systematic disposition remains unsettled. In the Botany of the Geological Survey (vol. 2, p. 114, 1880) Watson included it in **Cupressus goweniana,** and he has been followed by Sargent (Sylva N. Am., vol. 10, p. 107. 1896) and by Sudworth (Forest Trees Pac. Slope, p. 161, 1908). In Abrams' Trees and Shrubs of Southern California (Bull. N. Y. Bot. Gard, vol. 6, p. 330. 1910) it is referred to **C. guadalupensis,** a species erected by Watson for an endemic tree of the Mexican island whose name supplied the specific adjective. Jepson, in his Flora of California (pt. 1, p. 61. 1909) proposed a new species, **C. sargentii,** for a certain shrub or small tree which grows in isolated groves near the coast from Mendocino to the Santa Lucia mountains, and in the Sylva of California (Mem. Univ. Cal. vol. 1, p. 158. 1910), he with hesitation includes the San Diego trees in it. While these do not in all respects agree with the characters defined for **C. sargentii,** this disposition is the most satisfactory yet made. Phytogeographically the San Diego tree is not in harmony with the distribution of the genus on the Pacific Slope.

THE OLDEST KNOWN TREE.

By Anstruther Davidson, C. M., M. D.

This may seem a presumptuous title, as fossil trees in great variety have been unearthed from strata deposited millions of years ago, but the tree that forms the subject of this sketch is probably the oldest tree yet discovered in which the wood and bark are as well preserved as if the tree had just been felled.

In the course of the excavations now being carried on in the famous Brea beds near Los Angeles a tree was uncovered standing upright; in its original position, with a perfect root system attached.

The tree at base shows a solid trunk 52 inches in length, then forks into 2 large, nearly equal branches, one about 11 feet long, the other 8 feet, at which points both were apparently broken off. The main trunk has a girth of 52 inches. The longer branch was first encountered at about 4 feet from the surface. Around the tree trunk from tip to base there were removed dozens of skulls, and other remains of Saber-toothed Tiger, Camel, Elephant, Sloth, &c.

On removal of the tree, the roots of which spread laterally into the solid asphalt, the remains of the animals mentioned above were found as numerous as ever beneath it. The excavations have now reached a depth of 6 feet below the tree root, but have not reached the clay that naturally underlies the asphalt. The upturned root exposed a thin layer of loam in which the tree probably took root, and once established it seems to have flourished for many years, until it succumbed to age or the overflowing of the liquid asphalt. A lateral branch about 3 inches in diameter was removed for examination. This branch had been broken off some time before the tree was submerged, as the burrows made by some insect larvæ were quite apparent.

A section of the tree forwarded to the Smithsonian Institute was identified as **Cupressus Macnabiana** Murray. This tree is at present a native of Northern California. Jepson in "Silva of California" gives its range from "Napa to Shasta Co., then East to the Northern Sierras and West to the Coast Range; west of Shasta quite a large grove exists." Sudworth in "Trees of Pacific Coast" says "It ranges from 1100 to 5000 feet under climatic conditions of rainfall that varies from 13 to 62 inches per annum. The temperature varies from 100 degrees in summer to nearly zero in winter. Trees 5 to 8 inches in diameter show in rings of growth an age of 80 to 125 years. This tree probably does not live more than 200 or 300 years." Mr. Herbert J. Goudge polished a section of the branch removed and found the

rings of growth indicated a total age for this 3-inch branch of 130 years. Twenty-seven years were required to make the first inch in diameter, 27 years for the second inch, 72 for the third inch.

Whether these animal and vegetable remains in the asphalt beds are 10,000 or 50,000 years old or 250,000, as some have supposed, we have no accurate means of determining, but the presence of the Cypress gives a somewhat definite clue to the climatic conditions that prevailed when the Sloth, Mastodon, and Saber Tooth Tiger animated our district. Besides the Cypress many seeds of **Juniperus occidentalis** and a few of the Manzanita have been found. This Juniper is abundant in the Northern and Rocky Mountains, but is only sparingly represented in Southern California.

On Mt. San Antonio, at the height of 10,000 feet and on the Margin of Bear Valley dam at 6700 feet, there are a small number of trees and these are 40 and 80 miles distant from the asphalt beds. A few Manzanitas still survive in Griffith Park, but in Southern California this shrub usually ranges above 4000 feet altitude. The associations of these 3 trees in such close proximity naturally suggest a climate different from the present, and unless there has been a change in the adaptations of those trees the climate then must have been akin to our mountain or northern climate now; more moisture, with probably a lesser range of daily and seasonal temperature.

Future discoveries may of course modify this view. As the giant Sloth was an herbivorous animal, it is doubtful if such trees as Cypress and Juniper could possibly supply it with the sustenance required for such a large body.

European investigations would suggest that there has been no material change in that climate for many years. The trunks of the Scottish fir found by the writer in the peat bogs of the North of Scotland, and presumed to have fallen before the time of the Roman invasion, show the same rate of growth as those of the present day.

The cultivation of the date affords a delicate test as regards climate and its distribution in Palestine today indicates that there has been no variation in the annual temperature since old testament times. A moister period preceded this in Palestine, but Dr. Blanckenhorn estimates that this period ended 50,000 years ago, and that the existing conditions have remained unaltered for the last 10,000 years. Similar investigations in Egypt indicate that there has been no notable climatic changes in historic times. If the conditions as regards moisture on our coast paralleled those of Palestine and if Dr. Blanckenhorn's estimate of the time of change is correct, then it is 50,000 years since the climate here was of such a character as to favor the associated growth of

Juniper, Cypress and Manzanita in the region of the Brea beds—a practically sea level altitude.

How it was possible for a tree to attain the growth this Cypress did with its roots apparently submerged in solid asphalt it is difficult to imagine. After further explorations we may return to a consideration of this puzzling circumstance.

JAMES JOHN RIVERS

James John Rivers, a Fellow of this Academy, died at his home in Santa Monica, Calif., on the morning of December 16, 1913, at the age of nearly ninety years. He was born in Winchester, England, January 6, 1824. Not much is known of his early life, his parents and brothers all died when he was young, and he was left in charge of an aunt, from whom he inherited considerable wealth; he was a cousin of Sir John Rivers. J. J. Rivers studied medicine at the University of London, coming under the influence of Thomas Henry Huxley, whom he greatly admired; he attended Faraday's lectures and became acquainted with Charles Darwin, so it is not to be wondered at that the young man became an enthusiastic naturalist. He graduated from London about 1850 and entered Trinity College, Cambridge, as a student in zoology; his favorite sport at this time was cricket, playing on his aunt's meadow. At Dorking he was apprenticed to a pharmacist; and later went to London, entering the office of a Dr. Powers, who was a coleopterist. Rivers attended the meetings of the Entomological Society of London and met at these gatherings, Stainton, Douglas and Robert McLachlan, at whose home he lived for a time. He knew Francis Walker of the British Museum, and T. Vernon Wollaston, the student of the natural history of the Madeiran Islands. These and other noted naturalists he knew and associated with, and in later years could relate many interesting anecdotes to his young naturalist friends. He became acquainted with G. R. Crotch, who was in California in the '70's; and Janson of London was his ideal as a preparator of Coleoptera.

He lived and collected in Devonshire for a number of years after leaving London, where Crotch visited him in the '50's. He also collected in Cornwall, North Devon and other places. He left England about 1867 for the United States, settling first in Junction City, Kansas; was associated with the late Dr. Snow at the University of Kansas; he was in Denver for a short time and about the middle of the seventies moved to Berkeley, and became a Californian naturalist for the remainder of his life. He became acquainted with all the scientists of the state and played leading parts in all the vari-

ous activities, including the California Academy of Sciences of San Francisco. He was one of a little group of naturalists, including Behr, Behrens, Stretch, Harford, Dunn, Lockington and others, which met informally and known as the Arthrozoic Club.

Rivers was Curator of Organic Natural History in the University of California, until he resigned about 1895, and removed to Ocean Park and Santa Monica, where he resided till his death. Prof. Rivers, as he was generally and affectionately called, ranged over the whole, nearly, of the natural sciences; he was a representative of the old-time naturalists. He studied and published papers on living and fossil shells, Coleoptera, Lepidoptera, spiders, reptiles and collected plants. His published papers are mostly in the Proceedings of the California Academy of Sciences, the Bulletin of this Academy in nearly every volume, Zoe, Papilio, and Entomological News. The titles of some of these will give a little idea of his range of scientific work: Habits in the Life-History of Pleocoma Behrensii, A Miocene Shell in the Living State, Description of the Nest of the Californian Turret-Building Spider with Some References to Allied Species, The Species of Amblychila, Chariessa Umbertii, the preceding all in Zoe and a New Genus and Species of North American Scarabæidœ and a New Species of California Lepidoptera in the Proceedings of the California Academy. And in the Bulletin of this Academy: Butterfly Emigrants, Discovery of Another Foodplant of Uranotes melinus, Hûb., A Butterfly New to Southern California, The Caterpillar Plague, Euvanessa antiopa and other papers. His last paper, with a photographic plate, was published, only a short time before his death, in the Bulletin of this Academy for July, 1913, being: A New Species of Bathytoma from the Upper Pleistocene of San Pedro, Cal.

Rivers' fine collection of Coleoptera which contained a number of types and specimens from Horn and Le Conte, was sold to Walter Horn of Berlin, Germany, many years ago. In the Lepidoptera he made a special study of the genera Melitæa and Clisiocampa, describing a new species of the former. His collection of shells was acquired by Pomona College in part, and by Beloit College, Wisconsin; and the later collections and library by Dr. F. C. Clark of Santa Monica.

Of greatest value, greater than his published work and collections, was the influence of his personality on those who were privileged to have known him; that cannot be expressed in words. He was a real naturalist, and to have known him was a great privilege. His little workshop and museum behind his house, filled with books and specimens, will always be remembered by those who were ever in it.—Fordyce Grinnell, Jr.

SECRETARY'S REPORT

Three regular monthly meetings of the Academy have been held this season, viz.:

1. October 13, 1913. Lecturer, Ford A. Carpenter, LL.D., Subject, "Weather in the Making."

2. November 10, 1913. Lecturer, Mr. Adolphe Danziger. Subject, "What the Orient Gave to the Occident."

3. December 8, 1913. Lecturer, Dr. A. G. Smith. Subject, "The Parking Systems of Progressive Cities."

Meetings of the various sections have been held to date as follows:

1. October 14, 1913, Biological Section. Speaker, Prof. Ralph Benton. Subject, "Bees."

2. November 11, 1913, Biological Section. Speaker, Mr. H. S. Swarth. Subject, "Birds of Southern California;" also, S. Stillman Berry, PhD., subject, "Cephalopods."

3. November 24, 1913, Zoological Section. Speakers, Mr. William Wood, Dr. A. G. Smith and Commissioner B. R. Jones. Subjects, "Shade Trees in Parkings and Lawns," "Our Horticultural Problems of Southern California," and "Our Insect Pests and How we Deal with Them."

4. December 9, 1913, Biologcial Section. Speaker, Mr. J. O. Beebe. Subject, "Crinoids" (Fossil "sea-lilies.")

Directors meetings have been held as follows:

1. July 9, 1913, at the University Club, Los Angeles.
2. September 5, 1913, at Hotel Alexandria.
3. December 8, 1913, at the State Normal School.

The following committees have been appointed by the president:

Publication Committee—Holdridge O. Collins, Dr. Anstruther Davidson, William A. Spalding.

Finance Committee—Samuel J. Keese, William A. Spalding, George W. Parsons.

Program Committee—William H. Knight, George W. Parsons, William L. Watts.

The following members have been elected Fellows of the Academy: Arthur Burnett Benton, F. A. I. A.; Prof. Charles Lincoln Edwards, PhD.; Robert LeRoy Beardsley.

Numerous publications and exchanges have been received by the Academy and the work of the Secretary's office is steadily increasing.

Respectfully submitted,

ROBERT LeROY BEARDSLEY,
Secretary.

MONTHLY MEETING

October, 1913

The lectures for the season of 1913-1914 began Monday evening, October 13th, at Symphony Hall, 232 South Hill street, on which occasion Ford A. Carpenter, Local Forecaster of the United States Weather Bureau, and member of the American Climatological Association, gave a lecture, illustrated with lantern slides, on "Weather in the Making."

The lecturer was introduced by Mr. Arthur B. Benton, President of the Academy, and spoke of the causes and effects of the record-breaking weather of 1913—the first killing frost in January, the first phenomenal flood in February, the first hot night in September, and the first aerial soundings in California. The lecturer also gave an account of the history and organization of the United States Weather

Bureau. The meteorograph and basket which rose fifteen miles above Catalina and recorded a temperature of 85 degrees below zero was exhibited.

Messrs. Gilbert, Whiting, Watts and Knight made brief reports of the sections of the Academy dealing with Zoology, Biology, Geology and Astronomy, respectively. Mr. Knight also gave a brief account of an "Astronomical Club" which exists in Los Angeles. Mr. Daggett, the Curator of the Museum of History, Science and Art in Exposition Park, was called upon for a few remarks and spoke upon the Academy's collections and the recent work in the Brea beds which has resulted in the exhuming of a number of very remarkable fossil remains, among others the trunk of an ancient tree.

The meeting was exceptionally well attended.

ROBERT L. BEARDSLEY,
Secretary.

MONTHLY MEETING

November, 1913

A regular monthly meeting of the Academy was held in the library of the State Normal School on Monday evening, November 10, 1913, at 8 o'clock.

President Arthur B. Benton introduced the speaker, Mr. Adolphe Danziger, author and historian, former United States consul at Madrid, Spain, who addressed the meeting. Subject, "What the Orient Gave to the Occident," being a brief review of the introduction into European countries of the arts, sciences, religion and architecture, through the invasion of the Moors and Jews from Assyria and Arabia into the Spanish peninsula durin the sixth to the twelfth centuries.

ROBERT LeROY BEARDSLEY,
Secretary.

MONTHLY MEETING

December, 1913

A regular meeting of the Academy was held in the library of the State Normal School, Grand avenue and Fifth street, on Monday evening, December 8, 1913.

The meeting was called to order by President Arthur B. Benton, who presided. The Secretary announced a meeting of the Biological Section to be held the following evening, Tuesday, December 29th. The Chairman of the Zoological Section then made an announcement.

The speaker of the evening was introduced by President Benton, being Dr. A. G. Smith, for the last five years horticultural inspector of Los Angeles county. Subject, "The Parking Systems of Progressive Cities," some of the problems encountered in caring for trees on the streets and in residential grounds.

Dr. Smith began his remarks by reading an original paper on the subject. Stereopticon views were then exhibited showing the scale insect and various tree parasites, also views showing a comparison between various street trees and parkings in the city of Los Angeles and in eastern cities.

After the conclusion of the lecture considerable discussion on the subject ensued and remarks were addressed to the meeting by Mr. Lissner, Mr. Rhodes, County Supervisor Norton, Prof. J. Z. Gilbert and others. Some of the men who have been engaged in horticultural

work in and about Los Angeles gave an outline of various difficulties encountered in the pursuit of their work.

Professor Gilbert moved that the chair appoint a committee of two members from the Academy to act with similar committees which might be appointed by other organizations in Los Angeles to initiate proceedings of such a nature that the public and the city government should recognize the urgent need of proper care for the street and shade trees of Los Angeles. Mr. Knight seconded the motion and recommended that the committee should be comprised of three or more persons and that the President of the Academy should be one of the committee. This was accepted by Professor Gilbert, and the motion as amended was unanimously carried. The chair asked for time in which to consider the appointment of the committee.

ROBERT LeROY BEARDSLEY,
Secretary.

DIRECTORS' MEETING

Immediately after the above meeting on December 8, 1913, at the State Normal School, a meeting of the Board of Directors was held and the board considered the advisability of having a lecture presented before the Academy by Prof. Ritter of the University of California. Treasurer Keese advised the board as to the cost of such a lecture, and after some discussion it was decided to have the lecture. There being no further business the board adjourned.

ROBERT LeROY BEARDSLEY,
Secretary.

DIRECTORS' MEETING

July 9, 1913

A meeting of the Board of Directors of the Academy was held at the University Club, Los Angeles, on Wednesday, July 9, 1913, at 12:15 o'clock p. m. The following gentlemen were present: Arthur B. Benton, Robert L. Beardsley, Samuel J. Keese, George W. Parsons, William A. Spalding and William L. Watts.

A motion was unanimously carried to the effect that certain funds of the Academy should be discreetly and advantageously invested in a manner to be recommended by the Finance Committee.

Arthur Burnett Benton, Charles Lincoln Edwards and Robert LeRoy Beardsley were unanimously elected Fellows of the Academy. There being no further business the board adjourned.

ROBERT LeROY BEARDSLEY,
Secretary.

DIRECTORS' MEETING

September 5, 1913

Directors Knight, Davidson, Parsons, Watts and Benton and members B. R. Baumgardt and Dr. Bishop met by appointment at the Hotel Alexandria. Los Angeles, to confer with Marquis Frederic de Gerin of France.

Prior to the conference a directors' meeting was held. A discussion as to the place of meeting for the Academy for the current season brought out the unanimous opinion of those present that the Assembly Hall of the Los Angeles Polytechnic High School was not

best adapted for the purpose, as its location, its size and some unadaptability of arrangement were all against its use.

Marquis de Gerin received the Academy delegation in his room. He stated that as a member of the French Academy and a physician he was deeply interested in scientific matters; that as he was visiting California on private business he had been requested to ascertain the possibilities of a world's conference of accredited scientific men being held in California during the Panama-Pacific Exposition. After considerable discussion he was assured that the Academy would cooperate to the extent of its ability to bring about such a conference.

A visit to the County Museum and to the Brea beds was arranged for M. de Gerin during his stay in Los Angeles.

ARTHUR B. BENTON,
President.

ZOOLOGICAL SECTION MEETING

November, 1913

The November meeting of the Zoological Section was held in the library of the State Normal School on Monday evening, November 24, 1913, at 8 o'clock. Invitation cards were extended to all of the members of the Academy.

Mr. William Wood, County Horticultural Commissioner, was introduced by Chairman J. Z. Gilbert. After his remarks Mr. Wood introduced Dr. A. G. Smith of Pasadena, who read a paper on "Shade Trees in Parkings and Lawns." Prof. J. Z. Gilbert then made some remarks and introduced Commissioner B. R. Jones, the lecturer of the evening, who spoke on "Our Horticultural Problems of Southern California." or "Our Insect Pests and How We Deal With Them."

The lecture was illustrated with stereopticon views showing numerous insects and pests. Real specimens from the field were also exhibited. A member of the audience then being called upon by the chairman gave an interesting account of the methods and work of quarantine which obtain in the receipt of shipments of plants, shrubs, fruit, etc., from other places.

The Biological Section of the Academy met on Tuesday evening, October 14, 1913, in the library of the State Normal School, Los Angeles, at 8 o'clock. Dr. C. A. Whiting, chairman, presided, and thirty-five persons were present.

Prof. Ralph Benton of the University of Southern California gave a very interesting lecture on the habits, structure and life history of bees, illustrated with carefully prepared charts, blackboard drawings, and set of pressed specimens of the principle honey producing plants of this region; an observatory hive with the bees at work inside, was also on exhibition at the close of the meeting; the lecture was followed by questions and discussion.

Mr. John Comstock told of the capture of a large series of Lycaena **neurona**, on Mt. Wilson, which is interesting on account of its non-sexual dimorphism; and of some work which he proposed to do with the same.

Mr. Grinnell exhibited a collection of beetles, **Cychrus** and **Omus**, collected by the Secretary of the Academy, Mr. Beardsley, in the high Sierras during the summer; and mentioned a few interesting points concerning the same.

The meeting adjourned at 9:45.

F. GRINNELL, Jr.,
Secretary.

The Biological Section of the Academy met on Tuesday evening, November 11, 1913, in the library of the State Normal School, Los Angeles, at 8 o'clock. Dr. C. A. Whiting, chairman, presided, and about sixty persons present.

Mr. Harry S. Swarth, assistant director of the Museum of History, Art and Science in Exposition Park, was the lecturer of the evening and gave an interesting account of the geographical distribution of birds in Southern California particularly, prefacing his remarks with a definition of a bird and something concerning the structure of birds. Questions and discussion following, and Mr. Swarth called attention to a few important recent publications on California birds.

Dr. Samuel Stillman Berry, of the Scripps Institution for Biological Research of La Jolla, gave an account of some of his original work with the Pacific Ocean Cephalopods (devil-fishes, squids, etc.). He exhibited a specimen of a new genus and species which he had recently described **Nematolampas regalis;** and presented the Academy with a copy of the publication containing it.

Mr. Swarth exhibited a series of song-sparrows showing the effects of geographical distribution and isolation. Meeting adjourned at 9:45.

F. GRINNELL, Jr.,
Acting Secretary.

The Biological Section of the Academy met on Tuesday evening, December 9, 1913, at 8 o'clock, at the residence of Mr. J. O. Beebe, 342 West 54th street, Los Angeles. There were about twenty-five persons present, and the chairman, Dr. C. A. Whiting, presided.

Mr. J. O. Beebe exhibited his wonderful collection of fossil Crinoids or Sea-lilies all collected by himself and Mrs. Beebe in the middle-western states; and also wonderfully well prepared models of the whole and parts of various forms. Mr. Beebe first showed a chart of the geologic horizons or formations and the place where the Crinoids first appeared; he then showed a large series of forms of other living things which occurred at the same time—molluscs, lepidodendrons, etc., which gave a fine idea of the surroundings at that early time in the history of the earth. A series of models were shown to illustrate the evolution of the different forms up towards the modern starfish, with special reference to the changes in the tentacles or feeding organs. A pleasing informality extended throughout the meeting, everyone asking questions.

The meeting adjourned at 10 o'clock.

F. GRINNELL, Jr.,
Acting Secretary.

BULLETIN

OF THE

SOUTHERN CALIFORNIA ACADEMY *of* SCIENCES

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BULLETIN

OF THE

Southern California Academy of Sciences

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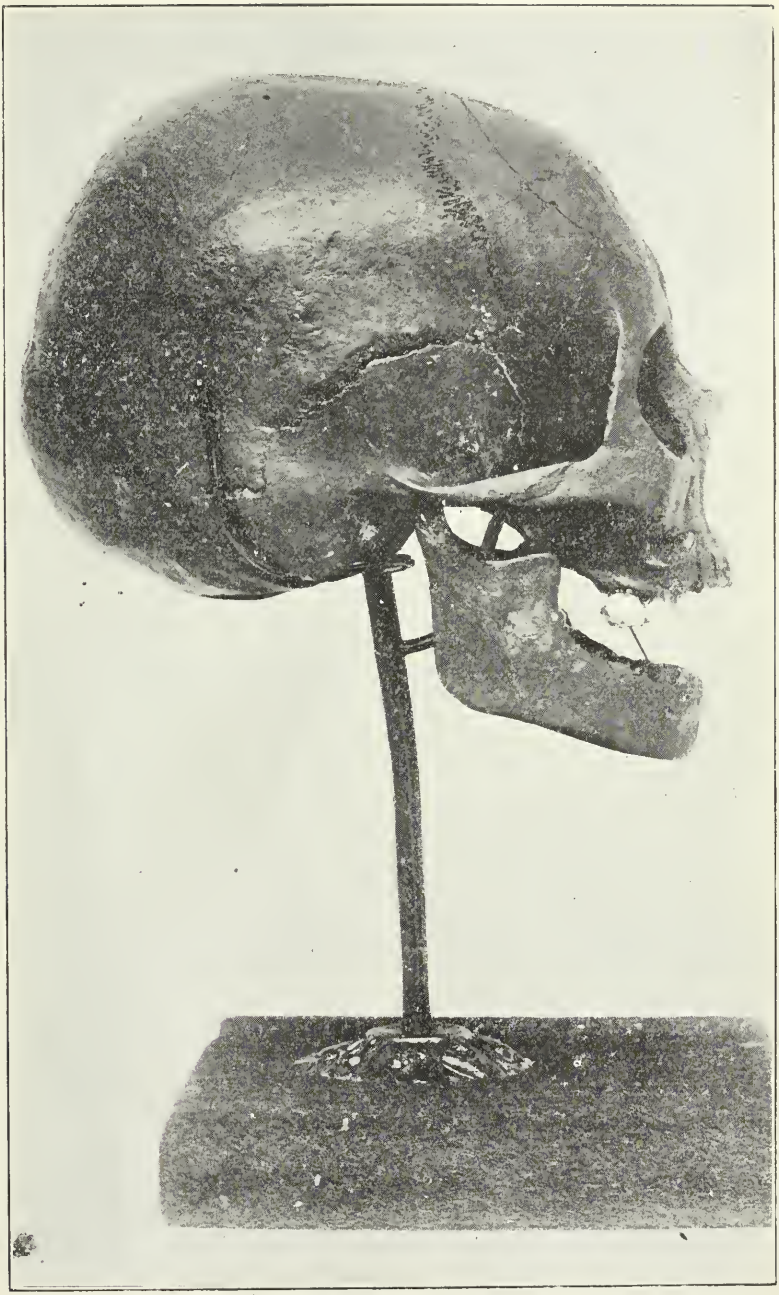


THE BREA MAID

THE BREA MAID

The following report on the prehistoric remains of this individual was made by Prof. J. C. Merriam at an open meeting in the County Museum on the evening of June 11, 1914.

The skull is now on exhibition in the Museum at Exposition Park.

The following report is copied from the full address given in the Examiner of June 12, 1914:

The majority of the bones of the prehistoric animals are found in the vents or chimneys through which the oil seeped up from the underlying strata.

The human bones were all found in the north chimney of Pit 10, where the history of accumulation is more complicated than in the south vent. The pit containing the human remains also contains all of the presumably associated specimens representing extinct animals.

The human remains are found rather widely scattered between a depth of about six feet and nine feet.

The whole collection of human remains seems to represent one individual. The bones are generally very much worn. The wear in some cases suggests movement within the pit in such a manner that sand in the tar, or resting against the wall of the chimney, has cut away the bone by long continued rubbing.

Enough of the human skeleton was found in the pit to give a fairly satisfactory idea as to the characteristics of the individual it represents.

The skull is that of a small person of middle age, possibly a woman. The brain case is relatively as large as that in some of the living native races of America.

The racial characteristics do not differ decidedly from those of people whose remains have been excavated in mounds on Santa Rosa Island off the coast of Southern California.

So far as the characteristics of the skeleton are concerned, it is not necessary to suppose that this is the skull of a person who lived at a remote time, when the human family was in a relatively low stage of evolution.

This skull is not comparable to those of ancient races of the Neanderthal or earlier types. On the other hand, one must not forget that people of a fairly advanced stage of brain development were already in existence at the beginning of the present or recent geological period.

Estimates Age.

The character of the human remains taken by themselves indicates a time either a portion of the present or recent period,

or not earlier than the end of the Pleistocene period immediately preceding it.

A summing up of the available information regarding the age of the human skeleton found in Pit 10 at Rancho La Brea from all points of view is as follows:

1—The evidence of geologic occurrence in the asphalt chimney taken by itself counts for relatively little owing to the peculiar conditions under which these deposits are formed. Insofar as this is of value it suggests an age later than that of the tar pits containing the typical Rancho La Brea fauna.

Later Than La Brea Fauna.

2—The fauna associated with the human remains in Pit 10 is quite different from the typical Pleistocene Rancho La Brea fauna, and must have inhabited this region at a different period. The fauna in Pit 10 is closely related to that of the present or recent period. It is distinctly later in age than the typical Rancho La Brea fauna.

3—The characteristics of the human remains, taken by themselves, show a stage of development similar to that of man of the present day and not older than man of the latest Pleistocene time.

4—The evidence as a whole indicates that the human skeleton from Pit 10 is of a period much later than the typical Rancho La Brea fauna, the time being either within the recent period or not earlier than the very latest portion of Plestocene time immediately preceding the present. The possible association of the human remains with extinct species, such as the giant **Teratornis,** may indicate some antiquity for the human being, or may indicate comparatively late persistence of birds or mammals now extinct in this region.

5—Measured in terms of years, it is not possible to give a definite estimate of the age of the skeleton from Pit 10. It may suffice to state that this person did not live in the period of the Pleistocene, low-browed Neanderthal man of Europe. It belongs to the distinctly modern stage of evolution.

It does not necessarily belong to the present historic period, but cannot be considered as having antedated it by many thousands of years. The age of this specimen may perhaps be measured in thousands of years, but probably not in tens of thousands.

6—The study of the remains at Pit 10 is a problem similar to the occurrence of an arrowhead found in a comparatively recent asphalt deposit in the University of California excavations of 1912. The arrowhead was found imbedded in a deposit somewhat similar to that in Pit 10, and the fauna associated with it was of the same general character as that in Pit 10.

Last Word Not Written.

7—The final summing up of all evidence relative to the antiquity of the Rancho La Brea skeleton will depend on a very detailed and exhaustive study of the typical Pleistocene Rancho La Brea fauna, of the fauna from the later tar deposits like that of Pit 10, and of the existing fauna of California.

No one of these three factors is, as yet, satisfactorily known. Until they are all known, the last word on this subject cannot be written. The significance of this statement may seem larger when reinforced by the remarks that the skeletons of a large percentage of our living species have never yet been carefully studied in the way in which this work must be done for use in investigations such as those concerned in this problem.

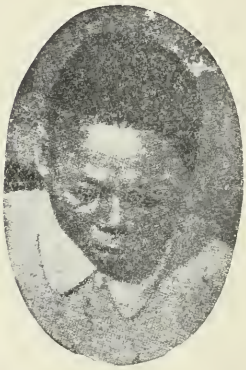
From whatever point the study of this specimen is viewed it is well worth exhaustive scientific investigation.

JOHN C. MERRIAM.

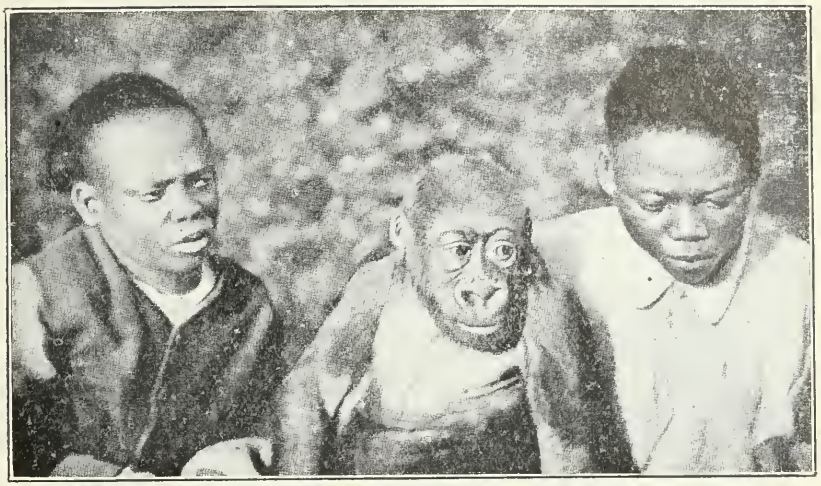
June 11, 1914.

TO THINK IS TO CONQUER

Animal Ancestry of Man



—*H. M. Bernelot Moens*



TWO NEGRO BOYS AND A YOUNG GORILLA

ANIMAL ANCESTRY OF MAN

Among the different problems that humanity must solve, the problem of the descent of man is one of the most interesting and important.

Many people are interested in having a genealogy of some hundred years' duration and look with condescension upon those who have not, but they dislike to extend their genealogy as far as primitive man, to the animals, or the first cell.

If an extensive genealogy gives the right to look down upon those who have none, then the horses, camels, cattle and swine have the right to look down upon us, because they already had their ancestors when ours were not yet upon this planet. So that we, as well as emperors, princes, counts and barons are but parvenues in comparison with these animals.

He who is above prejudice can have the certainty that he is a highly developed animal.

The animal most closely related to us is the anthropoid ape.

The distance between the anthropoid apes and man is not so great as the distance between the anthropoid apes and all other animals, including the inferior ape or monkey. There are four species of anthropoid apes in existence: the gorilla and the chimpanzee found in the Congo, the orang-outang and the gibbon found in the East Indies.

When seeing the great external resemblance between men and apes, especially the anthropoid kinds, the mere casual observer must come to the conclusion that the difference

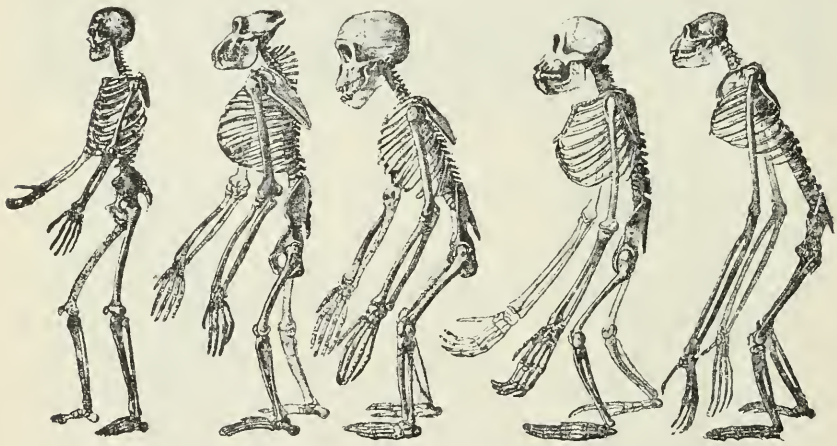
between these animals and man cannot be great; at all events, that in the whole animal kingdom there is not a single being which is so very much like man.

When we look at it from a scientific point of view, all the parts of the body, both external and internal, which we find in man are also found in the anthropoid apes.

The number of bones forming the skeleton (about 200) is the same, as is also the number of muscles (about 300) by which they are moved.

Both the number and the position of the teeth are the same with the anthropoid apes and with man.

SKELETONS



MAN, GORILLA, CHIMPANZEE, OURANG-OUTANG AND GIBBON

In each case the nervous elements, constituting the principal components of the central nerve system (the brain and the spinal cord), are identical.

The generative organs are built in the same way and have identical functions; the mature females of the anthropoid apes have a periodic discharge of blood from the uterus (womb) analogous to the menstruation of women. The secretion of the milk and the nursing of the new-born are the same with both.

The greatest resemblance, moreover, exists between the embryo of the anthropoid ape and that of man. The way in which it is fed in the body of the mother is the same with the anthropoid ape and man. Both possess a placenta in the form of a disc, formed in the same strikingly characteristic way, different from all monkeys and other animals.

Blood examinations show that blood of the same forma-

tion flows through the blood vessels of the two. No other animal has like blood.

Animal species which are not related have different blood, i e., the blood of one species is more or less deleterious to the blood of the other. In a few minutes, for instance, the cat and the rabbit die with spasmodic symptoms, when by connecting the carotid arteries the blood of these animals flows together, because the red blood corpuscles of one kind of blood are destroyed by the serum of the other. With two cats or two rabbits, on the contrary, this experiment can be made with impunity, as they possess the same kind of blood. In this respect species of animals which are closely related possess, likewise, the same kind of blood. So, for instance, the blood of the horse and the ass, of the dog and the wolf, of the hare and the rabbit, etc., may be mixed without harm: the respective red corpuscles are not destroyed.

The blood serum of man destroys the red corpuscles of all animals experimented upon, such as the frog, the eel, the viper, the pigeon, the hen, the heron, the horse, the pig, the cow, the rabbit, the guinea-pig, the dog, the cat, the hedgehog, the lemurs, the monkeys of the New World (Ateles, Pithesciurus) and monkeys of the Old World (Cynocephalus, Macacus, Rhesus), except the red corpuscles of the anthropoid apes.

ANIMALS, VERY CLOSELY RELATED WHICH HAVE THE SAME KIND OF BLOOD, e. g., the horse and the ass, the horse and the zebra, the dog and the wolf, the hare and the rabbit, the leopard and the puma, the lion and the tiger, the wanderoo monkey and the brown-black macaque, HAVE OFFSPRING (hybrids).

MAN AND ANTHROPOID APES HAVE LIKEWISE THE SAME KIND OF BLOOD, AND CONSEQUENTLY A CROSSING OF THE TWO MUST ALSO RESULT IN OFFSPRING.

This scientific basis of the crossing of man and anthropoid apes is so certain, that it is of the greatest importance to make the experiment.

The fecundation could be done in an artificial way so that anthropoid apes could be fecundated artificially by the sperm of man, especially by the sperm of pygmies (dwarfs of the Congo) and of several negro races.

It would be necessary to do all these experiments in the Congo because the anthropoid apes, when removed from their native climate, nearly all die of consumption, bronchitis and pneumonia, before they are full grown.

In their native habitat the anthropoid apes can be provided with those natural physical conditions and surrounding which are necessary to the success of this kind of experiment. They must not only have scientifically arranged cages, but also isolated parts of the wood at their disposal. This is to be

obtained by surrounding those parts with trenches deep and wide enough to prevent their escape.

The exact meaning of artificial fecundation is the bringing of the spermatozoon into immediate contact with the ovum; this term is also used for any artificial facilitation of the contact of these two cells, that is to say, not by the way of sexual union.

As a rule, people have no very exact ideas of the way in which the process of development from cell to infant in the maternal womb takes place.

People do not know generally that every human being, like all other animals and plants, was one single cell at the beginning—the ovum, which with man measures 1-5 mm. in diameter. The formation of these ova takes place with woman in special glands (ovaries). If, now, a new individual is to develop from this ovum, fecundation is indispensable.

The process of fecundation takes place when a spermatozoon* penetrates the ovum, after which the latter begins to undergo the changes which finally result in the complete organism of the infant at birth.

Sexual intercourse is even not at all necessary, as successful artificial fecundation proves. This operation is always possible with a normal woman, and is harmless.

Not only has the artificial fecundation of mammals (as squirrel, rabbit, dog and and horse) been successful, but also, in the same way, animals of different species (as hare and rabbit), but with blood of the same formation, have been crossed.

From this it follows that it is possible to carry out artificial fecundation with all animals of the same species or closely related species, as in the case of anthropoid apes and man.

For this it is necessary to know the anatomical structure and the physiological functions of the generative organs of the anthropoid apes, and, moreover to be entirely conversant with the special method to be applied, based on this knowledge.

The descendants (hybrids) of man and anthropoid apes, we will call them ape-men, will resemble the creatures, the remains of which have been found and that have their place between anthropoid apes and man. As, however, the remains of what has existed are preserved only under favourable circumstances, the chance of finding anything is very small, and yet several skulls have already been found which have belonged to creatures that must be placed between the anthropoid apes and man.

The three skulls, (Fig. 2, 3 and 4) one found in 1856 in the valley of Neander near Dusseldorf and now on view in the museum at Bonn; another found in 1887 in one of the

* The spermatozoon are the active fertilizing agents found in the sperm; with man their length is 0.055 mm. more or less.

SKULLS

Fig. 1.  of the Modern Man.

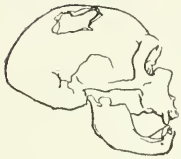
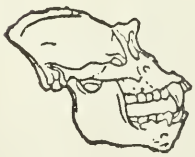
Fig. 2.  of the Proto Man (found in La Chapelle-aux-Saints)

Fig. 3.  of the Proto Man (found in Neandertal)

Fig. 4.  of the Proto Man (found in Spy)

Fig. 5.  of the Ape Man (found in Trinil)

Fig. 6.  of a Young Gorilla

Fig. 7  of an Old Gorilla

caverns of Spy, near Namur, and preserved in the paleontological museum of the Liege University, and a third found in 1908 in a cavern of La Chapelle-aux-Saints in Corrèze, now in the museum of national history in Paris, show borders above the orbits, which are strikingly prominent. They have belonged to a species of man inferior to those now living; we will call them protomen.

A very precious find, however, is that of the year 1891 at Trinil, on the isle of Java, where the fourth skull (Fig. 5) was found, together with a left thigh bone and two molars. The creature to which these bones belonged, and to which has been given the name of Pithecanthropus erectus (upright-walking ape-man), may as well be a hybrid of an anthropoid ape and man as a form between these two. The remains are preserved in Haarlem in Holland.

A whole bed of bones, with the remains of at least ten individuals of protomen has been found in a cavern near the village Krapina in Croatia, and can be seen in the museum at Agram.

Also in the year 1907 in the neighbourhood of Heidelberg a very heavy lower jaw with a receding chin, that must have belonged to a protoman has been discovered. This lower jaw is in the museum at Heidelberg.

It is not alone that the frontal region of the skull of the protoman and the Pithecanthropus erectus are less developed, but the face is also different from that of man, having the ape-like expression. In man the forehead is at first vertical and then rounds gradually backward, while in the anthropoid apes and protomen the forehead slopes backward from the supra orbital ridges. In man the lower jaw is so shaped as to make the chin protrude. In protomen the lower jaw at first extends vertically downward for a short distance and then rapidly recedes. In the anthropoid ape the lower jaw recedes immediately from the tooth line.

At all events, it is a fact that these remains are a proof **that formerly there lived creatures on earth which stood between man and the anthropoid ape.**

Atavism is the appearance in descendants of peculiarities which were possessed by their remote ancestors, but which in intervening generations have been suppressed or are latent.

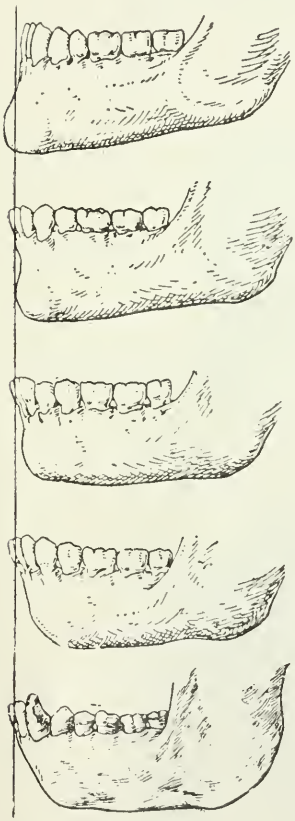
For instance, such beings as the Russian hairy man Andrian Zeftichew, the family Shrve Maong in which this peculiarity of hairiness appeared through three generations, or the Mexican danceuse Julia Pastrana, show that our ancestors were more hairy.

There have been born to the horse and ass descendants, mules, having three toes. This phenomenon gives us the right to form the hypothesis that their ancestors had three toes and as the remains of horses which actually had three toes on each

foot have been found, these hybrids have proven to us the characteristics of their ancestors.

So great is the liability of hybrids to exhibit atavism that there is a possibility that if men were crossed with anthropoid apes some atavism might appear which would reveal to us the characteristics of our ancestors.

LOWER JAWS



of the Caucasian

of the Negro

of the Australian Aborigine

of the Proto Man

and

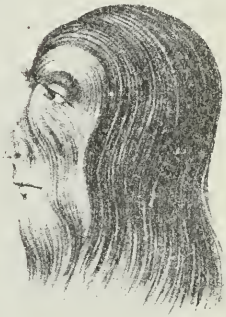
of the Ourang-Outang

Besides the finds already made, there will doubtless be discovered many more of the remains of creatures that will exhibit the different stages of the development of recent man.

Also it is possible that the entire carcass of such creatures may be found in a complete state of preservation.

In Siberia has been found the entire carcass of a mammoth frozen in ice—now on exhibition in the museum of St. Peters-

Andrian Jeftichew.



Shwe-Maung.

Julia Pastrana.

burg; in Galizia was found the greater part of a carcass of a rhinocerus preserved in oil and now in the museum at Lemberg. In these or other ways may nature hold our ancestors in keeping for us.

Since what we find is purely accidental and it is impossible to search everywhere, we cannot wait to complete our chain of evidence in this manner.

Instead we should use the knowledge we already possess, and which is herein outlined, to experiment in a direct way and by artificial fecundation of the anthropoid apes with the sperm of men to produce creatures which will resemble the intermediate forms between anthropoid apes and men and complete the series of facts we already possess relative to our origin.

This visible proof of the evolution of man from animals will be understood by all and have a marked influence upon human thought and social institutions. This influence will only tend to develop and ennoble mankind because with the discovery of truth will disappear the prejudices which now characterize our civilization.

Thus by going back into the past, shall we insure our advancement in the future, and just as man has been evolved from ape-like beings may we be enabled to produce a superman which will be as superior to us as we are to the protoman or Pithecanthropus erectus.

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* Read at the meeting of the Zoological Section, June, 1914.

CONSERVATION OF MARINE ALGAE

By Andrew C. Life

The attention of the scientific world is now being directed toward the ocean and its myriads of organisms as never before. The possibilities of the great ocean depths are without doubt not yet fully realized, and probably have not been imagined by the most optimistic sea explorers.

Recently stimulated study and research has been made of various phases of the great oceans and the organic world sustained by them.

The Challenger Expedition made under the auspices of the British Government has been a very great inspiration to the study of the physical and biological conditions of the great ocean depths.

The Challenger had on board a corps of scientific observers, who, during a period of three and a half years, studied the depth, salinity, temperature, currents and animal and vegetable inhabitants. Nearly all civilized nations have since sent out expeditions for deep-sea research. More recently an International Commission has been engaged in the exploration of the North and Norwegian Seas.

Marine laboratories have been established in many parts of the world. The Pacific coast has joined the ranks with three promising stations.

Along with the progress of the work has been the improvement of the methods and the instruments. Special apparatus is necessary on account of the great pressures to which the instruments are subject in deep-sea investigation.

This paper is particularly concerned with the Algæ of the sea, of which there are three classes, as follows: (1) Chlorophyciæ, green algæ; (2) Phæophyciæ, brown algæ; (3) Rhodophyciæ, red algæ. Of these the red and the brown are more abundant on our coast. In general the Chlorophyciæ are found between low and high water mark, the Phaeophyciæ both above and below low water mark, and the Rhodophyciæ, at or below low water mark, as a rule deeper than either of the preceding. The Phaeophyciæ, including the kelps, are probably more utilized than the other classes of marine algæ. Japan leads the world in the utilization of the so-called "sea weeds." Among the products are kanten, kombu, funori, and iodine. Kanten or vegetable isinglass is made from one of the red algæ, **Gelidium corneum.** This alga grows on rocks and is gotten by divers. Kanten is used as a food material as a jelly, by dissolving it in boiling water. It is also used for the sizing of textiles and stiffening the warp of silks. One form of it is known as agar agar and is used as a culture medium for the growth of bacteria. Its analysis shows, water 22%, protein 6.85%, and carbohydrates 61%.

Funori-seaweed glue is obtained from **Gloiopeltis coliformis,** which is collected by fishermen, sorted and cleaned. It is then soaked in fresh water, piled on bamboo poles and dried. The production of "funori" is an old industry, having originated in 1673.

Kombu is made from kelps, mainly from species of Laminaria. These kelps are gathered by poles and drags. Its value as a food material is indicated by the following analysis: protein 5% to 6.5%, fat 1.5% to 1.7%. This industry is the most common of the Japanese seaweed industries and gives employment to a great many people. Kombu is a standard food for the Japanese, entering into the daily bill of fare of the masses of the people.

Porphyra or "laver" is an algæ which is utilized by the Japanese as a food material. This alga is abundant on the California coast. It is dried and placed over a fire to make it crisp, when it is ready to be placed in soups or sauces to give them an agreeable flavor.

The seaweed industries are in an undeveloped state in our country, the most important one being the production of "Irish moss."

Irish moss is gotten from **Chondrus crispus,** a red alga quite abundant on the Atlantic coast. It is collected by hand or by the use of rakes, washed in salt water and placed on the sandy beach to dry. This is repeated three times, when the color has nearly all bleached out. Care needs to be taken that rain does not fall on this sea hay, as fresh water is destructive to it. It is used for blanc mange, and medicinally as a demulcent for coughs when mixed with sugar and lemon. The New England States are engaged in this industry to some extent

Another industry to which some attention is given in the United States is the production of iodine from the brown algæ. In the chemical process of extracting the iodine there are two valuable by-products formed, nitrate of soda and sodium chloride. This industry is now decreasing in the United States on account of competition with the Peruvian iodine deposits.

Recently the production of potassium from the kelps has begun to interest the chemical world. Chemical analyses were made of several kelps at San Diego, California, by Balch in 1909.

Young floats of **Nereocystis gigantia** in 2100 grms. contained 1026 grms. Kel., about 48.85%. Older floats showed about 37.20% and 0.55% iodine.

Nereocystis lentkiana showed about 15% higher potassium salt content.

Macrocystis Pyrifera—Giant Kelp—showed 76.25% potassium salts and some iodine. K. Cl. is extruded from this drying plant in almost a pure state.

One ton of kelp may give 500 lbs. pure potassium salt and about 3 lbs. of iodine, worth from 20 to 25 dollars.

The source of the potassium lies in the fact that sea water contains about 1/25 of 1% of pure potassium.

As fertilizers the marine algæ have been extensively used for a "top dressing." They enrich the soil and produce a vigorous growth of corn, potatoes, turnips, clover and pasture.

Their fertilizer value is due to the great amount of potassium and nitrogen compounds that they contain. There is a lack of phosphates. The nitrogen is not available until decomposition and putrefaction have taken place.

As progress is made in the utilization of these gardens of the sea there is danger that the supply be exhausted by wasteful methods. The undeveloped or partially developed natural resources of the ocean are becoming more important and are certainly worthy of consideration with other natural resources in connection with the question of conservation.

Lines that may be pursued leading to a better conservation of the ocean's vegetable resources are: (1) acquaintance with these plants and their characteristics; (2) knowledge of their means of propagation and regeneration; (3) the relation of the seasons to their growth and development; (4) the physiology of their food relations; (5) their distribution and the factors concerned with distribution and orientation in different depths of water; (6) care that poisonous or otherwise injurious materials do not pollute the ocean water where these are abundant.

The "kelps" are the most prominent marine plants on the southern California coast that are utilized. Of these **Macrocystis pyrifera, Egregia lævigata,** and **Nereocystic lentkiana** are the most common. Particular attention has been given to Egregia of the adjacent coasts, and there is indication of seasonal effect, as a new growth has been observed to begin about the last of February or first of March.

Where the waves had broken off the main part of the plant, regeneration was observed to be taking place at near the hold-fast. In this alga growth takes place from the upper portion of the stipe and regeneration proceeds rapidly from this point.

Also young plants of Egregia were found in March, just getting a foothold on the rocks.

Rigg, in a discussion of regeneration in the kelps, divides it into renewal of blade and restoration of entire plant. According to his discussion, the blades are renewed from the interior, and renewal of the plant from injury is from the actively growing region. He suggests that a part only of a kelp bed be cut at once, to give it a better chance for restoration.

The question of pollution of certain portions of the sea

and the consequent destruction of the small organisms therein by sewage and other means is worthy of attention.

The "plankton" flora, which consists largely of small floating organisms, at various depths, but usually near the surface, forms a considerable part of the food of some of the fishes. Diatoms form the principal part of this pelagic flora, and are quite sensitive to various foreign substances in the sea water. Because of the inter-relation of these small organisms and the food animals such as fish, attention should be given to their conservation.

The author wishes to announce work in progress along these lines, to be published when terminated.

VENICE MARINE BIOLOGICAL STATION,
UNIVERSITY OF SOUTHERN CALIFORNIA.

NOTES ON SOUTHERN CALIFORNIA FLORA

Anstruther Davidson, C. M., M. D.

Salix mackenziana Hook.—"High Mts. Sierra Nevada (Mariposa and Calaveras Co.), Lake Co. and far northward, apparently rare in California." (Jepson's Flora of California.)

This is not uncommon on Bishop Creek, Inyo Co., 9000 to 10000 alt.

Lilium kelleyanum Lemmon—The only reported station for this is Bubbs Creek, where it was found by Lemmon and by him described. The description given is very meagre. One plant of what is probably this species was found near Andrews camp. It closely resembles Parry's lily in shape and markings, but is about one-quarter smaller, and the stamens and filaments are very short; the latter one the stamens three lines long.

Phacelia eisenii Brandegee.—This species common in the Sequoia National Park is represented by a dwarfish form on the eastern slope of the range.

Gilia stansburyii Heller—Common on Bishop Creek.

Gilia breweri Greene—Not infrequent in wet ground near snow line on Bishop Creek. Death valley is the only other reported station south of Truckee and Nevada Counties.

Draba breweri Wats—"Mt. Dana 12000 ft. White Mts. 13000 ft." (Synoptical Flora.) This is quite abundant at S. Lake, Inyo Co., about 10000 ft.

Arabis inamoena Greene—Fairly abundant on south fork Bishop Creek.

Arabis davidsonii Greene—More common on the borders of South Lake than in its original station on the north fork

of Bishop Creek. To the original description made from a fruiting specimen the following note may aid in identification.

"Sepals ovate oblong one-eighth inch long; petals spatulate, one-sixteenth inch wide, expanded to one-eighth at apex, one-fourth inch long, white or light pinkish."

Lepidium perfoliatum L.—First discovered at Hollywood in 1910, found last year by Mr. G. L. Moxley at Annandale.

Alisma plantago L.—Discovered growing abundantly near Dominguez Station by Geo. L. Moxeley.

Aphanisma blitoides L.—Abundant on bluffs at Pt. Firmin and Redondo. Reported in the local catalogue but omitted in Prof. Jepson's "Flora of California."

Styrax californica Lam.—Mountains near Glendale (Miss Bashford).

Nemacladus ramosissimus var. **montanus** Greene—This plant named by Greene was discovered 30 or 40 years ago in the Sierra Madre Mts. and I believe it has not since been collected. This season I found a few plants at Camp Bonita on the San Gabriel River. It is unlike N. ramosissimus in that its flowers are one-half the size and its petals are pink instead of white. The basal leaves are characteristic. In the Synoptical Flora it is given as a variety but it deserves specific rank.

Sherardia arvensis. L.—Not infrequent, casual in lawns.

Sisymbrium al tissimum. L.—A European immigrant and ballast weed in the eastern states. I first observed a solitary plant of this species in Hollywood in 1910. Next season one was found in Laurel Canyon and the season following at Sierra Madre. This season it is not infrequent along roadsides in the San Fernando Valley and at Newhall.

MONTHLY MEETING

January, 1914

A regular meeting of the Academy was held at the Auditorium of the Friday Morning Club building on January 23rd, at eight o'clock p. m. There was an exceptionally good attendance of members and the general public. Professor William Jackson Humphreys, Physicist, Supervising Director of the United States Weather Bureau Research Observatory, engaged in special investigations of the upper isothermal layer of the atmosphere, in pressure effect on arc spectra, and in general radiation and absorption problems; also Vice President of the Aero-Dynamic Committee of the Smithsonian Institution, gave a most interesting lecture on "Volcanoes and Other Factors in Climatic Control," illustrated with fine lantern views.

The very great reduction of the solar heat reaching the earth when the higher atmosphere was obstructed with volcanic dust proved a most interesting topic and gave occasion for many questions from the audience, all of which were most skilfully answered or discussed by the speaker.

ARTHUR B. BENTON,
President.

RESIGNATION OF SECRETARY

On account of the pressure of the duties of another office to which he had been elected prior to his election as Secretary of this Academy, Mr. Robert L. Beardsley resigned as Director and Secretary in the month of January.

LUNCHEON AND DIRECTORS' MEETING

January 24th, 1914

At the invitation of the President of the Academy, the Directors met at luncheon Professor William Jackson Humphreys. The luncheon was at the Jonathan Club, Los Angeles. Professor Humphreys gave some account of his very interesting experiences on scientific expeditions for the observation of solar eclipses, and answered the questions of Directors in a manner to prove beyond question his ability as a thoroughly informed scientist.

ARTHUR B. BENTON,
President.

MONTHLY MEETING

May, 1914

The Academy met at the State Normal School on the evening of May 12th. Professor A. C. Life read a paper, illustrated by specimens and photographs, his subject being, "The Conservation of Marine Algae." The commercial value of sea weeds was explained and the necessity of regulation by law of the industry to prevent their destruction and the consequent loss of the fisheries as well as of the algae.

The President reported that he had attended the funeral of the late Dr. C. A. Whiting, who was killed at South Pasadena on May 7th, by collision of an electric railway car with the automobile in which

he, with his wife and son, were riding. That Mr. Knight had attended as an honorary pall-bearer and Professor J. Gilbert by appointment of the President to officially represent the Academy.

Dr. Whiting at the time of his death was the chairman of the Biological Section of the Academy.

The committee on resolutions on the death of Dr. Whiting, which had been appointed by the President, made its report by Prof. Charles L. Edwards, its chairman. The minute was by vote ordered spread on the records of the Academy, and that a copy should be sent to the widow.

Mr. Samuel J. Keese reported the death of W. P. Bolton, late printer for the Academy, and he was appointed by the President to prepare resolutions on that event.

A vote of thanks was given to Prof. Life and the meeting, on motion, adjourned.

ARTHUR B. BENTON,
President.

LUNCHEON AND DIRECTORS' MEETING

May 15th, 1914

The Directors met at luncheon, the guests of Mr. Samuel J. Keese, at the University Club. There were present Messrs. Keese, Knight, Parsons, Davidson, Spalding and Benton. The decision was reached to have the June meeting at the County Museum, if agreeable to the Board of Governors, and to hold the annual election for Directors at that time. Dr. Davidson was appointed to make request to the Governors.

ARTHUR B. BENTON,
President.

MINUTE ON THE DEATH OF DR. C. A. WHITING

Late Chairman of the Biological Section of the Southern California Academy of Sciences

The members of the Southern California Academy of Sciences have learned with grief of the shocking death of Dr. C. A. Whiting. We desire to record our appreciation of the faithful service of Dr. Whiting to the Academy, and his unfailing devotion with zeal and enthusiasm to whatever duty he accepted and his genial spirit of courtesy and helpfulness to all. He possessed the spirit of the true scientist and teacher; always ready to share his knowledge with others and always appreciative of the efforts of others in matters of scientific research. His devotion to duty was equaled by a native and genuine courtesy which added much to the pleasure as well as the profit of his association with the Academy, and we shall greatly miss both his genial personality and his helpful contributions to the progress of this organization.

CHARLES L. EDWARDS,
MELVILLE DOZIER,
GEO. W. PARSONS,
Committee.

Los Angeles, Cal., May 12th, 1914.

ANNUAL MEETING

1914

The Annual Meeting of the Academy was held at the County Museum, Exposition Park, on Friday, June 5th, at eight o'clock p. m., President Arthur B. Benton in the chair. The President's report was read: Six General Meetings and six formal Directors' Meetings were held during the year. The report gave a resume of the general meetings and the subjects discussed at them. During the year the Secretary, Mr. Robert L. Beardsley, resigned because of press of other business. His position was not filled, as it was desirable to secure the best possible service in this most important office, and the Directors were not able to, at the moment, determine on a successor. Three members were elected "Fellows," viz.: Prof. Charles Lincoln Edwards, Mr. Robert Leroy Bardsley and Arthur Burnett Benton, A. I. A. The urgent need of rooms suitable for the library, for the collections and for the meetings of the Academy was referred to in the report.

Prof. William Knight announced the absence of the Treasurer, Mr. Samuel L. Keese, on account of an accident to him, and read his report which showed receipts and disbursements, etc., as follows:

Receipts	$386.20
Disbursements	281.79
In Bank	$104.41

(Audited and found correct by Melville Dozier.)

The chair appointed Prof. Melville Dozier a committee to audit the account. Prof. J. Z. Gilbert read the report of the Zoological Section and made reference to the death of Dr. C. A. Whiting, the late chairman of the Biological Section.

Prof. Edwards, by request, spoke of his biological and zoological work in the Los Angeles public schools. He is teaching there the rudiments of these sciences.

Former Secretary, Holdridge O. Collins, LL.D., having recently returned from a long absence in Europe, was invited to speak, but preferred to defer any account of his experiences to a future occasion.

The following named gentlemen were elected Directors for the ensuing year, viz:

Arthur B. Benton	William H. Knight
Holdridge O. Collins	George W. Parsons
Anstruther Davidson	William Spalding
Melville Dozier	Albert B. Ulrey
Charles L. Edwards	William L. Watts

Samuel J. Keese

The tellers for the vote were Holdridge Collins and Charles Edwards.

After the adjournment of the business session those present had much satisfaction in viewing the collections of the Museum and Art Gallery, under the guidance of Mr. H. S. Swarts, assistant director.

ARTHUR B. BENTON,
President.

DIRECTORS' MEETING

A regularly called meeting of the Diectors elected for the ensuing year was held in the drawing room of the Jonathan Club on Thursday, June 25, 1914.

Present—Messrs. Benton, Collins, Davidson, Edwards, Keese, Parsons, Ulrey and Watts.

The gentlemen were most pleasantly entertained at lunch by President Benton, subsequent to which action was formally had upon matters pertaining to the Academy.

The following named gentlemen were elected officers for the year 1914-1915, viz:

President—Arthur Burnett Benton.
First Vice-President—Charles L. Edwards.
Second Vice-President—William L. Watts.
Third Vice-President—Anstruther Davidson.
Treasurer—Samuel J. Keese.
Secretary—Holdridge Ozro Collins.
President Benton appointed the following committees, viz:
Publication—Collins, Davidson and Spalding.
Finance—Keese, Spalding and Parsons.
Program—Knight, Parsons and Watts.

A most earnest discussion followed relating to the future action of the Academy, and ways and means for securing the ownership of a structure convenient and appropriate for our use; and individual members of the Board consented to take in charge some of the details of work for this purpose.

The Board received with gratification a short statement of the estimation held by some of the scientific organizations of Asia and Europe of the work of this Academy and the intense interest taken in the excavation of the fossil beds in Rancho la Brea.

Board adjourned.

HOLDRIDGE O. COLLINS, Secretary.

WANTED

Numbers of Volumes III, IV, V, VI of the Bulletin to complete files. Address the Secretary, Room 814 San Fernando Building, Los Angeles.

Southern California

Academy of Sciences

VOLUME XIV

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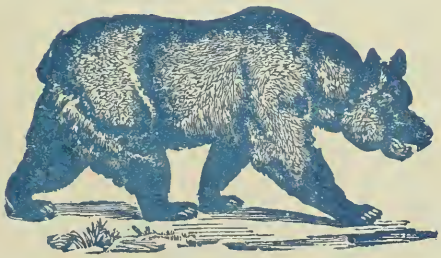
OF THE

SOUTHERN CALIFORNIA ACADEMY OF SCIENCES



LOS ANGELES, CALIFORNIA

BULLETIN

OF THE

Southern California Academy of Sciences

JANUARY, 1915

Volume XIV, Part 1

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ANSTRUTHER DAVIDSON ..... Third Vice-President
SAMUEL J. KEESE ..... Treasurer
HOLDRIDGE O. COLLINS ..... Secretary

William H. Knight — William A. Spalding
George W. Parsons — Albert B. Ulrey
Melville Dozier

Sections of the Academy

Astronomical Section

William H. Knight, Chairman — Melville Dozier, Secretary

Geological Section

William L. Watts, Chairman — George W. Parsons, Secretary

Biological Section

Albert B. Ulrey, Chairman — C. H. Phinney, Secretary

Zoological Section

James Z. Gilbert, Chairman — George W. Parsons, Secretary

Botanical Section

Anstruther Davidson, Chairman — T. Payne, Secretary

THE GAVEL

MADE OF FOSSILS FROM THE BREA PITS AT LOS ANGELES, CALIFORNIA

EDITORIAL

Upon the evening of Saturday, October 17, 1914, the twenty-third year of the establishment of the Academy of Sciences was celebrated by a Banquet at the City of Los Angeles. Around the board were seen the faces of many who had been its founders in 1891, and among these were Dr. A. Davidson, who was the second President, serving from 1892 until 1894; William H. Knight, who succeeded him until 1897; William A. Spalding, who wielded the gavel until 1899, and subsequently for four successive terms from 1909 to 1913, and Bernhard R. Baumgardt, who was Secretary for thirteen years, from 1893 until 1906, when he became President.

It was a happy reunion for many and a most interesting occasion of retrospection and introspection.

Mr. Spalding, as the principal speaker of the evening, gave a most feeling and interesting relation of the Activities of the Academy, its victorious conquests over financial discouragement, and in an environment of a newly settled land where few had the leisure or inclination to give attention to the higher intellectual attainments.

Mr. Spalding's address is a valuable contribution to the history of this Academy and it will be found in this issue of the Bulletin.

An interesting episode of this anniversary meeting was the presentation by Dr. Davidson of a gavel, undoubtedly the only one of the kind in existence.

Dr. Davidson conceived the idea of utilizing some of the ancient relics of the Brea pits in a way that might commem-

morate the association of this Academy of Sciences with the first exploration of these remains. Messrs. Daggett and Fisher perfected the mechanical arrangements and produced a gavel, the head composed of a vertebra of the Giant Sloth and the handle of the wood of the McNab Cypress found upright as it grew when the Sloth and Sabre-tooth Tiger fought each other under its branches. The parts are as perfect and sound as when entombed more than two hundred thousand years ago. A half-tone representation of this unique souvenir will be found herein.

Dr. Davidson expressed the hope that succeeding Chairmen may find in this unique Gavel a continued stimulus for further scientific research and investigation.

As some inquiry has been made concerning the executive officers of this Academy, a list is appended of those who have been Presidents, Secretaries and Treasurers since its organization.

Presidents

Dr. M. H. Alter	1 term	1891-1892
Dr. Anstruther Davidson	2 terms	1892-1894
William H. Knight	3 terms	1894-1897
William A. Spalding	1 term	1897-1898
Abbot Kinney	2 terms	1898-1900
William H. Knight	2 terms	1900-1902
Theodore B. Comstock	2 terms	1902-1904
Melville Dozier	2 terms	1904-1906
Bernhard R. Baumgardt	3 terms	1906-1909
William A. Spalding	4 terms	1909-1913
Arthur B. Benton	2 terms	1913-

Secretaries

Mrs. Mary E. Hart	2 terms	1891-1893
Bernhard R. Baumgardt	13 terms	1893-1906
Melville Dozier	2 terms	1906-1908
Robert L. Beardsley	6 months	1913
Holdridge Ozro Collins	8 terms	1908-

Treasurers

William Lundberg	1894-1895
George Roughton	1895-1896
George H. Bonebrake	1896-1897
Dr. E. A. Praeger	1897-1898
William H. Knight	1898-1899
W. C. Patterson	1899-1901
Dr. A. Davidson	1901-1903
G. Major Taber	1903-1906
Samuel J. Keese	1906-

One of the most interesting and instructive lectures delivered before the Academy of Sciences since its birth was the address, at the December, 1914, meeting by Pro. George E. Bailey, relating to the great advances made in scientific agriculture and particularly the use now made of explosives in securing bountiful harvests from soils considered worthless and lacking productive essentials. Prof. Bailey has promised us an article upon this subject which we hope to present to our members at an early date.

The results from the unabated vigor of the excavations in the Brea pits have been most astonishing. The deposits appear to be inexhaustible and, within the last two years, complete and perfect skeletons have been exhumed of many new species which roamed over the earth and roved the skies of this environment, no one can say how many hundreds of thousands of years ago. Among them are the skull and a few of the bones of a human being, probably that of a woman, and the gigantic skull, tusks and entire frame of an Imperial Elephant which, from their measurement, exceed in size the largest known to science. So many requests have been made for information concerning the character of these fossils brought to light since our Bulletin of January, 1910, that we hope to give an account of this work in our next issue.

Holdridge Ozro Collins.

WANTED

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A LITTLE RETROSPECT

Remarks of Toastmaster W. A. Spalding
at the Opening Banquet of the Academy.

When Samuel F. B. Morse in 1844 sent his first telegram over the experimental line between Baltimore and Washington, he couched it in these words: "What hath God wrought?" The inherent modesty of the inventor, the reverence for his source of inspiration and his concept of the momentous era which he was then inaugurating, were all expressed in these four one-syllable words. A more concise and memorable message has never been transmitted.

When I review the history of the Academy of Sciences for the twenty-three years of its life, I am reminded of the message of the immortal artist-inventor, and tempted to exclaim again: "What hath God wrought?" For, taking into consideration the humble beginning and modest pretensions of this organization, and considering the men who have sustained it and, in a sense moulded their lives into it; and looking at the individual achievements of these men during the almost quarter century in review, there is good cause for exclamation.

My mind reverts to the time when a mere handful of men—not exceeding ten or twelve—who were sincerely interested in scintific matters and wished to join their efforts in keeping the lamp burning, got together under the name of the Science Association of Los Angeles.

This was then a rather primitive and out-of-the way town of perhaps 50,000 inhabitants. It seemed as though we were not in line with any of the great events of the world or any of the notable developments in science. What could be achieved by a little handful of men without position or name, and working for the mere love of scientific truth? In the subsequent time—less than the span of one generation—this question has been answered.

We now find ourselves in the midst of the most tremendous social development in history. Here, on the Pacific Coast, is banking up the westward rolling wave that started before the day of human records, beyond the Hindu-Kush mountains in far-off Asia. Beginning with the first migrations of the Aryan races and traveling down through the history of civilization, this mighty ground-swell of evolution has encircled the globe and seems now entering upon its second cycle. We of the Pacific Coast, standing at the meeting point of the old and the new, may, with Tennyson, proclaim ourselves

"—heirs of all the ages,
In the foremost files of time."

Los Angeles has grown from a frontier town of 50,000 inhabitants to a modern metropolis of half a million. We are in touch with the great flow of commerce and the most ad-

vanced material development. Our social life throbs to the loftiest achievements in science, literature and art, and the world looks to us to bear aloft the standard of liberty, justice and peace.

Especially in science do we seem to have moved up close to the firing line, and this organization and its members individually have borne an honorable part in the advance.

The location of the Mount Wilson solar observatory in this county and the installation of a corps of observers of world-wide fame, have placed us in touch with the most progressive astronomy. It is a satisfaction to know that one of the members of this Academy—the late John D. Hooker—contributed toward the great hundred-inch reflector there in preparation, more than one hundred thousand dollars.

The opening of the most remarkable deposit of prehistoric animal remains ever discovered, in the Brea beds near this city, has attracted hither the attention of archaeologists and savants throughout the world. In grasping the importance of this discovery at an early day; in raising funds and obtaining concessions for exploration, and in mounting the first complete skeletons of several species, thereby forming the nucleus of the present collection in the Museum of History, Science and Art, this organization accomplished a work of lasting benefit to the cause of science. Here also our late associate, John D. Hooker, was the first and a most generous contributor. I regret that another member, Prof. J. Z. Gilbert, is not with us tonight. It was he, who, with his staff of assistants and high school pupils, performed the unattractive and unaesthetic task of excavating, cleaning and assembling these bones. Great credit is due Prof. Gilbert, who worked without financial reward, and his efficient and earnest pupil-assistants who, to a considerable extent, contributed their efforts.

In the field of California flora, and also in ornithology, our associate, Dr. Anstruther Davidson, has made indefatigable research, and his papers, published in the Bulletin of the Academy throughout these years, have attracted world-wide attention. It is a pleasure to note his contribution to the museum of botannical specimens representing twenty years of painstaking collection.

To our associate, Mr. B. R. Baumgardt, the speaker of this evening, the Academy owes a debt of gratitude deep and enduring. It was he, as Secretary in the old days for many successive terms, and afterward as President, who did more than any other man to keep interest awake and hold together the struggling organization. It is a great pleasure to know that in entering the field as a professional lecturer on matters of scientific, historical and ethical interest, he has achieved so pronounced a success, and that, in coming back to us with

honor and prestige, his love for the old-time organization is always expressed anew. I venture he will acknowledge that his years of earnest effort in this Academy constituted his preparatory course for the lecture field.

Another member, Mr. W. H. Knight, several times President and always a faithful worker, has pursued the unostentatious tenor of his way, contributing to the press and achieving a position as authority on all matters within his field. He is the staff writer who is called upon to give scientific information without sensationalism and present only facts that are accredited.

Another old-time member, Prof. W. L. Watts, has worked no less assiduously for the Academy, and in his profession as geologist has borne an important part in the development of the great oil fields of California.

Mr. George W. Parsons, another stand-by member, has borne the heat and burden of the day along his professional lines, and, as the result of years of persistent effort, has secured the erection of sign boards on the great Colorado desert, which will doubtless be the means of averting untold suffering and saving many lives in years to come.

There are several others whom I should mention. A few have gone over the great divide: Dr. Comstock, a faithful scientist, and for a term or two Secretary of the Academy; Dr. Whiting, long-time head of the Biological Section and Dean of the College of Osteopathy, who passed out this year as the result of a lamentable accident.

Dr. A. B. Ulrey, of the University of Southern California, who served several terms as Director, has done most valuable work in his microscopic study of the sting-ray.

Mr. S. J. Keese, our long-time and indispensable Treasurer, aside from building up the local business of one of the great electrical manufacturing concerns, has found time to achieve results in optics, micro-photography and color photography.

Prof. Melville Dozier deserves enrolment among the men who never lose interest in scientific matters and never fail in a responsibility to the Academy.

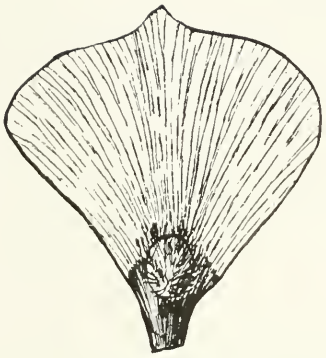
Our President, Arthur B. Benton, now entering upon his second term, has proved his loyalty and efficiency, and in these passing years has contributed in no small degree to the artistic and romantic architecture of Southern California.

Our stand-by Secretary, for lo, these many years, and faithful editor of the Bulletin, Mr. Holdridge O. Collins, just back from a trip around the world, is entitled to congratulations; so also is the Academy. We are glad that Mr. Collins found our Bulletin on file in the archives of some of the learned societies of the Orient, and that everywhere he went he was the recipient of distinguished attention from men of science and letters.

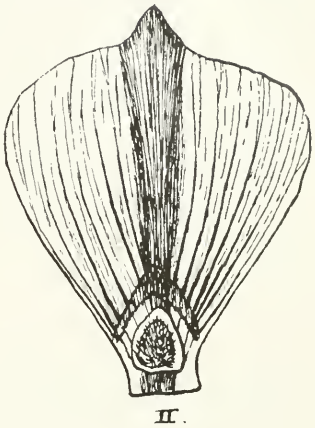
TWO NEW MARIPOSAS

Anstruther Davidson, C. M., M. D.

Calochortus discolor n. sp.



C. Campestris



C. Discolor

Stem bulbiferous, 12 to 18 inches tall, stem leaves channelled; flowers umbellate; sepals erect scarious margined, greenish externally and markedly striate, internally yellowish with purple edged brown spot; petals internally liliac 1½ in. long and ¾ in. wide, wedge shaped below broadly apiculate above, claw brown; gland of yellowish hairs, triangular (sometimes circular), on a yellow field edged with purple, no hairs outside of gland; externally petals greenish with a broad green stripe down the center the whole finely striate; stigma purple. Pod attenuate upwards with a white stripe on septum.

Flowering in July and August.

Abundant from Bishop, Inyo county, up Bishop Creek and its tributaries into the Sierra ranges up to 8000 or 9000 feet altitude. Type No. 2672. This has been distributed by Heller as **C. excavatus** Greene, but Dr. Greene, who examined this specimen, says it is not his species. Purdy (Cal. Acad. Proc., Vol. II, 148) classes all the green banded Mariposas as **C. macrocarpus** Doug. **C. discolor** possesses the green band and general habit of **C. macrocarpus** as illustrated by Purdy but in coloring and habitat it is sufficiently distinct.

C. excavatus Greene with its prominent gland and invenustus like appearance was originally discovered by Schockley in the neighborhood of Bishop and so far as I can discover it has

not been gathered again. I do not know where Schockley's type is deposited.

Calochortus campestris n. sp.

Stem nonbulbiferous, stiff, erect, nine inches high, stem leaves short, and channelled in half their length, one or two flowered;sepals narrowly scarious, erect purple spot at base, petals pink cuneate apiculate one inch long, ¾ inch wide, delicately striate with darker lines, gland of yellowish hairs circular with a few pale to purplish hairs near and around gland, claw purple; capsule attenuate one inch long. Flowering in June.

In the meadow lands in the town of Bishop. No. 2657 type in the author's herbarium.

This species was first sent to me by Mrs. W. C. Parcher of the Inyo Herald and one month later I gathered it in fruit in the same locality.

NOTES ON SOME SOUTHERN CALIFORNIA PLANTS

S. B. Parish.

Selaginella cinerascens A. A. Eaton

Very common on clay hillsides about San Diego Bay, where in summer acres are made ashen by the close carpet of its bleached creeping stems.

Cupressus sargentii Jepson

A third southern California station for this Cypress was added to the two previously known, by the discovery in April, 1914, of a group of six trees on a brushy hill about one mile south of Lilac schoolhouse, on a little-used road from Pala to Valley Center, and about seven miles beyond the first named place. The trees were 15-20 feet high, and in vigorous growth, but not fruiting, nor were there any indications that they had ever done so, although trees of apparently the same age at Tecate mountain were loaded with abundant fruitage. The mountains of San Diego county, in which the known stations of this Cypress are situated, are exceedingly rugged, and are traversed by few roads, so that it is reasonable to infer that they contain other small groves yet undiscovered.

Hordeum gussonianum Parl.

Shoestring Mine, in the upper end of Antelope Valley, on the road to Tejon Pass, May, 1914, Parish 9262, and in the

same neighborhood, in May, 1896, Davy 2331. According to Davy in Jepson's Flora of Western Middle California this grass is "very common throughout the state," and Hitchcock, in Jepson's Flora of California, notes it as "common." These statements are certainly erroneous so far as they relate to the southern counties, in which the only other collection known to me is Hall's 1196, at Warner's Ranch, May, 1899. But from the latitude of Stockton to the Oregon border, it is represented in herbaria by many collections, and in places is very abundant.

Eriogonum angulosum Benth. var. **variabile** (Heller) Parish, n. comb. E. variegatum Heller, Muhlenb. 2:24. 1905.

The type specimens, collected near Mojave railway station (Heller 7756), are small and young. Others collected subsequently by Mr. Heller, and distributed under this name are his 7732 from Sunset, 7747 from near Oil City, and 7796 from McKittrick. They are all more mature, and make it evident that the characters relied upon are at best of no more than varietal significance.

Eriogonum marifolium Torr. & Gray

Mount Wilson, June, 1916, George B. Grant. So far as reported this is the southernmost station for this species.

Eriogonum panduratum Watson

Palm Springs, Colorado desert, April, 1896, George B. Grant 6717. In the Botany of California (2:480), Watson states that the type material of this species was collected by J. G. Lemmon, "the locality uncertain," presumably in California, although the plant has been collected in Arizona. Grant's plant agrees with the description, and comes from a station at which Lemmon collected, but I have not seen the type.

Chenopodium leptophyllum Nutt.

Waterman Ranch, Barstow, Mojave desert, May, 1914, Parish 9318. This is the second recorded collection of this plant in the state, the previous one having been made long ago by Nevin, at Lang, in Los Angeles county, but it is probably commoner than might be hence inferred, since it is easily mistaken for C. album, and botanists are wont to give too little attention to weeds.

Atriplex semibaccata R. Br.

Introduced more than ten years ago as a highly recommended forage plant, this Saltbush was widely experimented with by farmers, but failed to meet expectations, and its culture was soon abandoned. It has, however, become a well established weed in many parts of southern California, where I have collected it, or observed it, in Imperial Valley, San Bernardino,

Los Angeles, Santa Monica and San Diego. About the latter city it is perhaps the most abundant plant of waysides and waste grounds.

Cycloloma atriplicifolia Coulter

Collected in 1909 by Mrs. C. M. Wilder, as a waif, along a road between Colton and Bloomington, and in July, 1914, by Parish (No. 9500) in the same locality, where it is now abundant and well established.

Batis maritimum Linn.

Abundant on dykes and banks of the salt marshes of False Bay, San Diego. Near Old Town, September, 1913, Parish 8721.

Diplotaxis muralis Linn.

This European weed is well established along a street in San Bernardino, where it was first seen in July, 1914 (Parish 9502), being the first authentic collection reported from the state. In Davidson's Plants of Los Angeles County (1896) it is entered as from Los Angeles and Redondo, but in the Bulletin of the Southern California Academy of Sciences 2:29 (1903) it is corrected to D. tenuifolia DC., which has also been collected at Pasadena, by Grant.

Lepidium perfoliatum Linn.

This Eurasian weed is a recent immigrant to the United States, and so far as reports indicate is, as yet, confined to the western states. Its first reported appearance was at Salt Lake, in 1908, and five years later it was reported by Garrett (Torreya 13:238) as abundant in that vicinity. In May, 1909, two plants were found by Heller growing in cinders along the railway track at Derby, a few miles west of Reno, Nevada; the following May he found it "growing rather plentifully along the railroad at Hood River, and in quantity at Pendleton," both in Oregon; and the same summer a specimen was found by the wayside at Reno (Muhlenb. 6:92), where it is now abundant. Davidson (Bull. S. Cal. Acad. 10:11) reported a few plants appearing at Hollywood in 1910, and (Ib. 13:14) at Annandale, both suburbs of Los Angeles. In May, 1913, two or three plants were collected by Mrs. M. F. Bradshaw at Orange, and in April, 1914, a single specimen was found by Parish at Point Loma, near San Diego. It has also made its appearance at a few places in central California. In 1912 Rattan got it in the Grand Cañon, Arizona. As yet it has not found a place in American Floras, but it may be readily recognized by its dimorphous leaves, the basal finely pinnatly dissected and approximate, and the rameal bractlike, entire, and so broadly auriculate as to appear perfoliate. Heller, l. c. gives a good plate of the plant.

Sisymbrium altissimum Linn.

Although the appearance in America of this Crucifer antedates that of Lepidium perfoliatum, so that it has been enrolled in some manuals, it is a comparatively recent immigrant, but already has spread from ocean to ocean, and in some places has earned the reputation of an obnoxious weed. Its California history is very short. At San Bernardino I first saw it, a single plant, in 1912, from the seed of which was produced the next year a goodly patch, and in the same summer of 1913 it was observed in abundance in a fallow field at Redlands, and in several places along the road in the adjacent Yucaipe valley. It is now, 1914, already widely spread in San Bernardino valley, but nowhere in abundance. Its Los Angeles history was related by Davidson in the preceding issue of this Bulletin (9:44). He observed it first in 1910 at Hollywood, in 1911 in Laurel Canyon and in 1912 at Sierra Madre, in each instance only a single plant. In 1913 he found it "not infrequent along roadsides in the San Fernando valley and at Newhall." It has not yet been reported from the upper part of the state, but probably occurs there. It may have reached the southern counties from Utah, as Garrett reports it (Torreya 13:238) as abundant everywhere about Salt Lake City in 1913, but unknown ten years before. It is a tumbleweed, and this habit facilitates its dissemination. Other western collections are Minneapolis, Sheldon in 1895; Snake River, Oregon, 1901, Cusick 2525, 2526; Glendale, Nevada, 1907, Kennedy 1572.

An account of its appearance and progress, east of the Pacific Coast, is given by E. S. Hill in Torreya 9:96, 1909, who noted its earliest recorded appearance in 1883 at Castle Mountain, in the Canadian Rockies. At the date of his paper Hill considered this weed "quite generally spread throughout the northern parts of the United States and the southern part of Canada."

Cleome serrulata Pursh

A waif in the railway yards at Barstow, May, 1914, Parish 9250.

Ribes roezlii Regel

Mill Creek Canyon, San Bernardino Mountains, altitude 6000 feet, May 22, 1913. Parish 3525.

Parosela polyadenia subnuda Parish

Occasional on the arid hills about Barstow, in the Mojave desert, May, 1914, Parish 9239. Owens Valley is the nearest station previously known.

Lupinus microcarpus Sims

Desert slope of Tejon Pass, near the summit, May 27, 1914, Parish 9256.

Astragalus pachypus Greene

In the sand bed of a dry wash, near the summit of Tejon Pass, May, 1914, Parish 9223. The type was collected by Mrs. Brandegee, in 1884, at Bealville in the "Mountains of Kern county."

Astragalus limatus Sheldon

This species was noted by me in Carnegie Publication 193, page 109, as endemic in Salton Sink, but its limits should be extended to the drainage of Salton Basin. It was collected by Brandegee at Borrego Spring, April, 1895; at Shafers Well, April, 1904, by H. E. Wilder; and in Split Mountain canyon, April, 1914, Parish 9040, and seen on Carrizo creek.

Euphorbia peplus Linn.

First noted at San Bernardino in 1895, as a rare weed in lawns and gardens; now very common. Also common in like places in San Diego.

Tetracoccus dioicus Englem.

On bushy hillsides, between Rainbow and Fallbrook, San Diego county, April, 1914, Parish 9130. The type was collected by Parry at Santo Tomaso in northern Lower California. Previous collections in this state are: Cleveland, near Table Mountain, and C. R. Orcutt, near Temecula (Brandegee, Zoe 5:230).

Sherardia arvensis Linn.

In a lawn, San Bernardino, July, 1913, Parish 8540. Collected in 1891 by Michner & Bioletti in Alameda county, and stated by Davidson to be "not infrequent in lawns" at Los Angeles (Bull. S. Acad. 9:44); otherwise unreported from the state.

Xanthium commune Britton

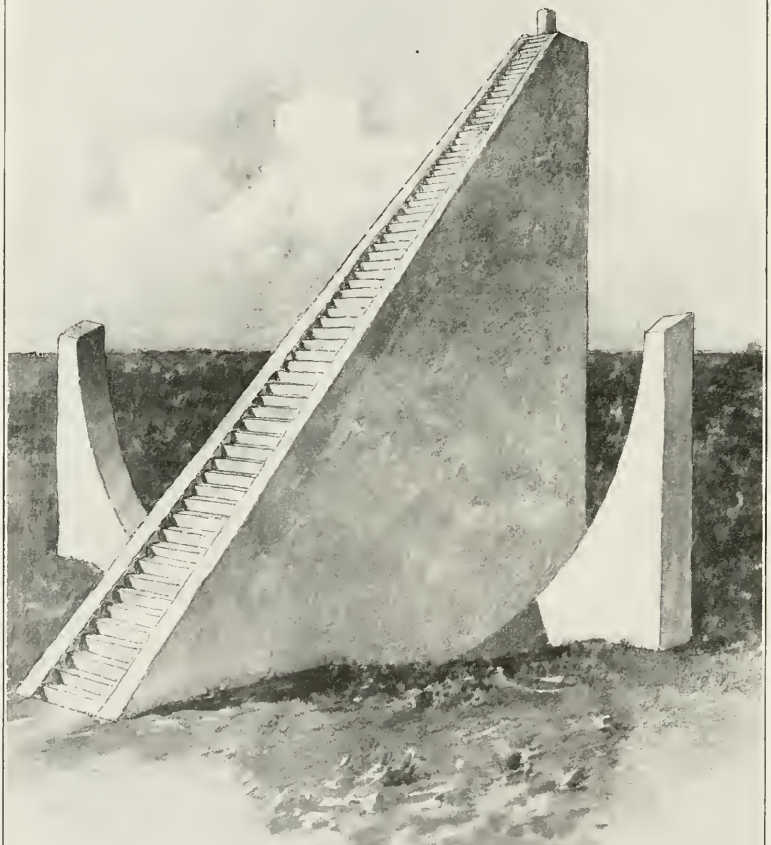
Common about San Diego; Old Town, Sept., 1913, Parish 8715, and in the same month on the Potrero Grades heretofore reported in the state only from the Colorado river bottoms at Fort Yuma and from Imperial valley.

Amblyopappus pusillus H. & A.

A characteristic seacoast species, common at the foot of the bluffs along the shore, now collected inland at Glendora, by Grant & Wheeler, May, 1904.

Tragopogon porrifolius Linn.

Common and thoroughly naturalized along streets and in waste places at Santa Monica. September, 1913, Parish 9133.



SUMRAT YANTRA

THE PRINCE OF DIALS AT DELHI

SUN-DIALS IN INDIA

By Holdridge O. Collins, LL.D.

TO THE lover of Astronomy, probably the most interesting objects in the Orient are the ponderous structures of bronze in China, and of masonry in India, erected during the early centuries of the Christian era.

Like the Elgin marbles of the Parthenon, the most striking and beautiful bronze instruments of China, were looted and transported to Germany by her military forces during the Boxer war, but the Observatories in India remain, some of them in ruins and others, whose huge dimensions, at this day practically in perfect condition, have resisted the devastations of war and the attacks of the elements during the many centuries of their existence. It is not feasible in one article to describe all the Astronomical implements, appliances and structures now as well preserved in India, as when erected, but it has been thought that a statement of the three greatest Sun-dials, standing in all their huge grandeur, may be of interest.

All the Astronomical Observatories and accessories in India were designed and erected by Maharajah Jai Singh, who rectified the calendar and corrected the Astronomical tables then in use, under the encouragement and financial appropriations of the Emperor Mohammed Shah.

He first constructed several brass instruments similar to those used by the Mohammedan astronomers of Samarcand and elsewhere; but finding that brass instruments were not accurate owing to their small size, the lack of divisions into minutes and seconds, the constant shaking and wearing of their axes. the displacement of the centers of their circles, and the shifting of their planes, he acquired the certain knowledge of the inaccurate determinations of Hipparchus, Ptolemy and others of the ancients. Erecting at Delhi, the Capital of the Mogul Empire, instruments of stone and lime, of perfect stability and huge size, all of his own invention, he found them giving him most satisfactory results, and, in order to corroborate his observations at Delhi, he built similar instruments at Jaipur, Muttra, Ujjain and Benares.

The Observatory at Muttra no longer exists and the one at Ujjain, passing from the possession of the Moguls to that of the Peshwas, is now owned by Scindia. Only those at Benares, Delhi and Jaipur are now in the possession or control of the English government.

In Isaiah xxxviii, 8, is found the first record of the existence of a Sun-dial:

"Behold I will cause the shadow on the steps, which is gone down on the dial of Ahaz with the sun to return backward ten

steps. So the sun returned ten steps on the dial whereon it was gone down."

The chronology of this imputed event is fixed as about 700 years before Christ.

Benares is one of the most interesting and oldest existing cities of the world. It is situated upon the North side of the Ganges river, the banks being paved with stone steps and terraced, and constantly congested by the burning-ghats, diminutive temples and the thousands of worshippers who flock to this place to wash away their sins in the sacred waters of the river.

Benares was formerly the center of the Buddhist religion, but, long ago, Buddhism succumbed to Brahminism and it has been swept out of India. Benares is the Mecca of Brahma, while Lucknow is the Rome of the Mohammedans. Benares has more than fifteen hundred Temples, the most notable of which are the Monkey Temple, so called from the multitude of monkeys which make their home here and are sacred to this place of worship; the Golden Temple, whose pagoda or tower is covered with gold leaf and intricate and delicate stone tracery, and the Aurangzeb Mosque with its two lofty needle-like towers, on the banks of the river.

The Observatory is on the second floor or roof of the building called Maun Mandir, commanding the banks of the Ganges. Upon a masonry wall faced with red sandstone are two instruments of bronze, called Dakshinottar Bithe Yantra, used for indicating the exact time of noon and the altitude and zenith distance of the heavenly bodies when they pass the meridian at night. The object for making two instruments of a like nature was for checking one with the other. There are several other instruments of bronze and stone, but of too complex a nature for detail in this paper.

The great Sun-dial with its two quadrant indicators of time is of solid masonry. The length of the style is 36 feet and the vertical height at the north end is 22 feet and 3½ inches. From its apex a fine view is presented of the city, the circling Ganges and the surrounding country. With the exception of its size and the angle of latitude, in every respect it resembles those at Delhi and Jaipur which I shall attempt to describe.

The present city of Delhi is of comparatively modern existence, having been established as late as the seventeenth century, by Shah Jehan, who erected his Imperial Palace on the banks of the river Jumna, and he surrounded his new city with the present massive wall. The enclosure of this walled fortress-palace contains marble structures which are exquisite gems of Oriental architecture, of which the two most celebrated are the Diwan-i-Kas, a place where the Emperor received in private audience, and the Diwan-i-Am for public royal assemblies. In this Hall was the wonderful Peacock throne which was carried away in 1739 when

Nadir Shaw invaded India with his Persian Army. The apartments occupied by the Emperor and his wives are in beautifully carved and inlaid marbles.

The British Army now uses this place for barracks. It is kept in excellent repair and visitors are permitted to wander through its precincts at their leisure.

While the entire limits of Delhi are interesting to the ethnologist, with the exception of the splendid Mosques, there is nothing of beauty to attract the attention of the speculator or excite the admiration of the aesthetic. The city has a poverty-stricken aspect; most of its buildings appear to be about to fall from age, and the unpaved streets are foul with the congestion of camels, horses, cows, goats, donkeys and children wallowing in the squalor of poverty.

Of the numerous and magnificent Temples for worship, I have space to mention only one, the Juma Masjid, the largest and most noted Mosque ever constructed by man. It was the work of Shah Jehan when building his new Delhi. It faces a quadrangle 450 feet square, paved with granite, inlaid with marble, around which are most picturesque cloisters. The Mosque extends 261 feet and is approached by a marvellous ascent of granite steps, the landing and interior being paved with white marble in intricate designs. It has three large Domes of white marble and a lofty minaret rises from each of the front corners. The interior walls and roof are lined with white marble, and within this mosque and its great court during religious festivals, more than ten thousand worshippers assemble at one time.

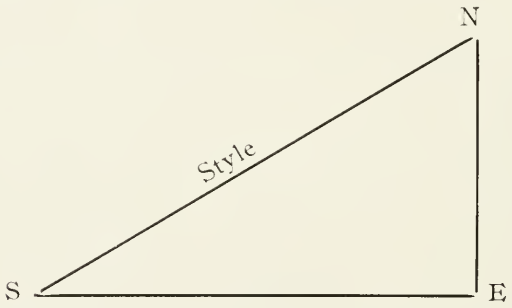
Ancient Delhi was located upon an area of over 45 square miles, South of the modern city, and it exhibits on every side of its dusty sterility, the extensive ruins of Temples, Palaces, Mosques, great residences surrounded by crumbling walls and dismantled Tombs, the evidences of a once populous and wealthy city, which must have been a center of education and culture of the highest rank before the power of Europe extended to this land. "The whole region seems to ache with age and penury." What has been the cause of this desolation and the obliteration of such a city, whose location is now inhabited by a degenerate people swarming in huts of mud or excavated in the stone masonry of the ruined walls surrounding the visitor for miles? An intelligent investigator of the cause of this most lamentable effect may arrive at a satisfactory answer.

In the center of this desolation stand the buildings of the great Astronomical Observatory. There are six separate structures of the most ponderous masonry, one of which bears a tablet reciting that they were all restored to perfection in the year 1910. Two of them are circular, with niches in the walls upon which can be indicated the ascension and declension of the stars. These stand immediately South of the great Sun-dial.

One form of a Sun-dial, and the one most familiar to us. is constructed as a right-angel triangle of metal or masonry, called a gnomon, a Greek word meaning an instructor or one that indicates, with the hypothenuse, called the rod or style, pointing to the North and parallel with the earth's axis—that is, its plane coincides with the meridian; and this, with a fixed surface, which may be the base upon which it stands, or a semi-circle—a quadrant upon each side—passing through its center and traced with lines indicating the hours and minutes and upon which falls the shadow of the style, is called a Sun-dial.

Giovanni Florio, an Englishman of Italian parentage, a Professor of Oxford University and a personal friend of Shakespeare, in one of his books published about 1598, describes the gnomon as "the know-man or gnow-man of a diall, the shadow whereof pointeth out the howers."

The figure may make the description clear, viz:



The hypothenuse or style SN is directed from South to North. SE is the surface of the Earth and NSE stands upon the meridian of the place where the dial is constructed. The latitude of the place is the angle at S, subtended at the center of the Earth by an arc of the meridian between the zenith and the celestial equator. Latitude is always equal to the altitude of the celestial pole.

An excellent representation of the Sun-dial at Delhi is presented by the annexed half-tone copy of an engraving I obtained in that city.

In the Hindu or Urdu language it is called the Brahat-Sumrat, the big Sun-dial, and Sumrat-Yantra, the Prince of Dials. It is constructed of brick masonry, its base being 104 feet long, the hypothenuse or style is 118 feet and 7 inches in length and the perpendicular is 56 feet and 7 inches from its base to the apex. The gnomon has steps in the center affording an easy ascent to the top, where stands a low circular tower upon which is a small modern Sun-dial of steel.

On each side, a masonry quadrant of a circle is built at a distance of 49 feet and 4 inches from the center of the gnomon. These quadrants pass under the base of the gnomon, which at

that point is in an excavation several feet below the surface of the ground, and, owing to percolation from an irrigation ditch in the vicinity, the lower segments of these quadrants are immersed in water and the time of the mid-day hours cannot now be read upon their face.

The shadow of this huge gnomon, falling at the lines graved upon the quadrants, shows the local time in hours, minutes and even seconds, and, watching this shadow as it slowly crept downward at the West quadrant, I noted the time to be ten hours and thirty minutes, or half after ten o'clock A. M. From the top of this huge structure a panorama of desolation, disintegration and degeneration is presented.

Ten miles South from this Sun-dial are the ruins of what was once the noble Kuwat-ul-Islam Mosque, and such portions of it as remain intact disclose the original magnificence of this old Palace for worship. Nowhere in the world, outside the limits of India, is to be found in the construction of buildings architectural work so elaborate, so intricate, so delicate, so beautiful in its character and so exquisite in its design and execution as can be seen today upon what remains of this and other Temples and Palaces.

Matthew Arnold wrote of that wonderful East that "Whatever airs of superiority Europe generally gives itself, all our religion has come and religion of some sort or other has still an empire over men's feelings such as it has nowhere else."

No thoughtful observer of those religious structures and the devout honor and reverence paid by these so-called heathens in their worship of what they accept as an over-ruling, super-natural Providence, cannot but be most profoundly impressed with the truth of what Arnold learned from his long experience in India.

A native architect said of the red sandstone: "Clever workmen chisel it so skilfully as no turner could do with wood, and their works vie with the picture books of Maui"—a legendary Persian artist.

The marble pierced screens under the Dome of the Taj Mahal which, at a short distance, look like fine lace, and the carvings on the tomb of the beloved wife do not equal in delicacy the work of the red sandstone seen in the Palaces and Mosques of Agra, Fatipur-sikri, Delhi, Amber, Udaipur and other places. From the tessellated floors up and over the ceilings, elaborate stone tracery runs riot over the fluted columns, cornices and niches of the interior. There are flowers and fruits, leaves, garlands, vines and grapes, men, women, animals and birds, gods and goddesses, geni, nymphs, griffins, dragons and chimerae of innumerable designs. Such miracles of fairyland, and brackets so fantastically twisted, were never wrought from unyielding marble, and it is difficult to realize that anything could induce so complete an architectural paradise built of stone, ivory and inlaid mosaic work.

Under cover of one of the large halls of the Monastery surrounding the enclosure of Kuwat-ul-Islam, whose roof is supported by more than one hundred pillars of carved red sandstone, each of which differs in design from all the rest, are four marble tablets, three of them severally inscribed in the Sanscrit, Hinde and Urdu language—the last named being the present language of India. The fourth tablet has an English translation, and the legend refers to the Monarch who erected the sky-piercing Kutab Minar within the enclosure. The translation reads as follows:

"He, on whose arm fame was inscribed by the sword, when, in battle in the Vauga countries (Bengal) he kneaded (and turned) back with (his) breast the enemies who, uniting together came against (him):—H. by whom having crossed in warfare the seven mouths of the (river) Sindhee, the Vahlik as were conquered:—He, by the breezes of whose powers the Southern Ocean is even still perfumed:—He, the remnant of the great zeal of whose energy, which entirely destroyed (his) enemies like (the remnant of the great glowing heat) of a burned out fire in a great forest, even now leaves not the earth: though he, the king, as if wearied, has quitted this earth and come to the other world moving in (bodily) form to the land (of Paradise) won by (the merit of) his actions, but remaining on this earth by (the memory of his) fame:—By him, the King—who attained sole supreme sovereignty in the world acquired by his own arm and (enjoyed) for a very long time: (and) who, having the name of Chandra, carried a beauty of countenance like (the beauty of) the full moon, having in faith fixed his mind upon the God (Vishnu) this lofty standard of the divine Vishnu was set up on the hill called Vishnupada. (4th century)"

The Kutab Minar, two hundred and thirty-eight feet high, is the tallest Minaret in the world, and there is nothing in the world that resembles it in its architectural design, its loveliness of stone carving from its base to its apex, its dignity and magnitude. Who can describe the indescribable or explain the inexplicable? It is one of the seven architectural wonders of India and the most perfect tower in existence, being as complete and unmarred as it was on the day of its completion. As nothing that has been said, written, pictured or sung of the Taj Mahal can reveal to the eye or mind its lovely perfection, so representation or imagination will fail to disclose the exquisite beauty and noble grandeur of the Kutab Minar. Not far from the Kutab Minar stands an historic lofty iron pillar of ponderous dimensions, erected many centuries ago, but its story cannot here be related.

Of the city of Jaipur I must say but little. We are interested more concerning its great Observatory.

The Maharajah or Sahib Bahadoor of this Province is named Mahadhosingje. His Prime Minister is a gentleman of culture and advanced ideas, introducing modern economic methods and encouraging the people to adopt modes conducive to their welfare.

The Maharajah is rather slow to introduce radical changes, and his Minister has been unable to obtain consent to establish an electric-light plant, the Maharajah saying that the gas lighting introduced by his father is good enough for him, but, imbued with the idea of preserving the old monuments built by his ancestors, he sanctioned the restoration of the Observatories, and its execution was completed about fourteen years ago.

The city is surrounded by a massive lofty wall, pierced for five huge gates. A street, about 150 feet wide, runs through its center and this is crossed at right angles by several other streets of the same width, running from wall to wall, and in the squares formed by the crossings are handsome fountains. The buildings facing these main thoroughfares are generally of a substantial and ornate character, but they present a peculiar aspect, as the exterior of most of them is decorated with art paintings, and they are all colored with a brilliant pink, whence the place is called the "Pink City." This pink aspect is a souvenir of the visit of King Edward VII when he was Prince of Wales, it having been a decoration for his reception, ordered by the Maharajah. It is the brightest, cleanest and handsomest city of Northern India, and in its general aspect resembles a city of Europe. It is located in the bend of a horse-shoe range of mountains, on whose summit frown the fortifications in which the Maharajah keeps his military stores, his jewels and treasures. No one other than his troops and ménage, is permitted access to these places. There is a superb Museum in the Ram Newas Park, principally devoted to the ethnology of Asia in general and of India in particular; and the Zoological Gardens, containing the world's creatures of fur, hair and feathers, are as complete and extensive as any I have seen. This Province is practically free from English control and the Maharajah is supreme.

His Palace is an impressive building surrounded by a very large and beautiful garden enclosure in the center of the city. In these grounds are the ponderous structures of the Observatory. The description of the Sun-dial at Delhi may be applied to the one at Jaipur with a few changes. This one is 90 feet high, the style is 182 feet long and the quadrants upon which the time is shadowed pass under the center of the gnomon at the surface of the ground. It also has the name Sumrat Yantra—Prince of Dials.

There are two circular Yantras or Dials called Ram Yantras for reading azimuths and altitudes, and twelve huge stone structures, forming a large sector, each one placed for observation of a particular sign of the zodiac and the determination of celestial longitude and latitude. There are many other curious instruments and peculiar contrivances, perhaps the most striking of which is an immense brass circular plate upon which is engraved a map of the heavens.

This Observatory was the most extensive of the five constructed by Jai Singh, and in listening to the very courteous

Director in charge, as he explained to me the uses of the many strange appliances with which I was surrounded, I was profoundly impressed by the mechanical skill exhibited in the construction of those works by that ancient Astronomer and the knowledge he had gained regarding the adjustment of our Universe, beyond which but little is known at this day. Truly he "gave *his* heart to know wisdom," and we may say of our day what the Preacher wrote of his time:

'Is there anything whereof it may be said, 'See, this is new'? It hath been already of old time, which was before us."

BANCROFT ETZ BEEMAN

By Holdridge O. Collins, LL. D.

Born in Cortland County, New York, on December 31, 1844, Bancroft Etz Beeman achieved a high grade of intellectual culture in the several educational institutions of his native State. His entire mature life up to his fifty-sixth year was devoted to successful commercial pursuits, in which he acquired a comfortable estate, and, retiring from all business avocations, in the year 1900 he came to California and made a new home for his little family in Los Angeles.

Many years ago he was elected a member of this Academy of Sciences, and he became an active participant in the conduct of its work, having served as a Director and an active worker in all its labors up to within a short time prior to his death.

During the last fourteen years of his life he made many voyages to Europe, Africa and the Orient, circling the globe in his wanderings. While in Japan he became greatly interested in the ichthyology of that region of the Pacific waters, accumulating valuable publications by the Japanese Government upon that branch of science; and through his suggestions and advice the Library of this Academy was enriched by several monographs upon that subject, issued by the Smithsonian Institution.

A man modest and unpretentious in his social intercourse, with a total lack of strenuous self assertion, none but his more intimate friends were aware of his great interest in all institutions conducted for the amelioration of the indigent sick and afflicted and for establishments conducted for free instruction in the higher branches of erudition.

That this was not in him a mere abstract emotion is evidenced by the provisions of his last will and testament, wherein he bequeathed large amounts to Hospitals, the Industrial Home and to this Academy of Sciences ten thousand dollars "to defray the expense of free lectures or other proper entertainments bearing upon scientific topics."

His death occurred on November 11, 1914 at his home in Los Angeles, and in the copy of the records of this Academy, printed herein upon another page, will be found the Memorial unanimously adopted by the Directors of this Academy of Sciences.

TRANSACTIONS OF THE ACADEMY

Academy Meeting

The first meeting of the Academy for the Season 1914-1915 was held on Saturday evening, October 17, 1914, in the parlor of Christopher's restaurant, President Benton in the chair.

Mr. W. A. Spalding, ex-President, as toastmaster, most feelingly related the activities of the Academy since its inception and the devoted labors of its founders, some of whom are yet with us, and, in presenting Mr. B. R. Baumgardt, the speaker of the evening, he referred to the National reputation achieved by that gentleman as an investigator and lecturer, as an evolution from his studies and experience while performing the duties as the first Secretary of this Academy.

Mr. Baumgardt gave a geographical and historical review of the causes which, at this day, have involved in warfare the great Nations of the eastern Continents, closing with a most interesting and instructive statement of the Trend of Modern Thought in Europe.

A very pleasant episode of the evening was the presentation to the Academy by Dr. A. Davidson of a Gavel, unique in that the hammer is composed of a vertebra of the extinct Giant Ground Sloth, the handle being of the wood McNab cypress, both having been taken from the excavations of La Brea Rancho, where they had been preserved in their original condition of perfection by their air-tight coffin since the quaternary age.

Directors' Meeting

A meeting of the Directors was held on December 3, 1914, in the office of the President.

Present: Benton, Collins, Davidson, Knight, Parsons, Spalding and Watts.

The record of the proceedings of the Directors on June 25 and of the Academy on October 17 was read and approved.

The Committee on Program reported that lecturers had been secured to address the Academy in December, and January, 1915, and that proper arrangements would be made.

The President and Secretary were appointed a committee to select a design significant of the work of the Academy, to be used upon printed matter and stationery.

The death of Bancroft E. Beeman was announced and the Secretary proposed the following memorial which was unanimously adopted, to-wit:

Bancroft E. Beeman

On the eleventh day of November, 1914, at the city of Los Angeles, departed this life Bancroft E. Beeman.

For many years he had been an active member of the Southern California Academy of Sciences, and on May 4, 1908, he was elected a Director for the ensuing year ending in June, 1909.

During the period of his membership in this Academy his attention was attracted to that phase of our work devoted to the free dissemination of information relating to the later scientific discoveries for the conservation of public health, especially in the more densely populated districts, and our recommendations for rigid inspection and enforcement of sanitary and antiseptic regulations in large municipalities, and we have a most profound realization that this interest was not ephemeral, but a lasting one, as we read from his last Will and Testament:

"I give and bequeath to the Southern California Academy of Sciences (of which I am a member at this date) the sum of ten thousand dollars, suggesting that said sum be loaned on good security and that the interest thereon be used to defray the expense of free lectures, or other proper entertainments, bearing on scintific topics."
or other proper entertainments, bearing on scientific topics."

The Directors of this Academy hereby place upon record an expression of their sorrow for the loss of an associate so zealous in the prosecution of investigations instituted solely as well for the information of the individual inquirer as for the welfare of the general public, and we extend to the widow and son our profound sympathy for them in their great affliction.

The Secretary was authorized to have said Memorial suitably engrossed and transmitted to Mrs. Beeman.

There being no further business the Board adjourned.

Academy Meeting

The monthly meeting was held on Wednesday, December 16, 1914, in Symphony Hall, President Benton in the chair.

Probably at no time has been presented before this Academy of Sciences a topic more interesting or instructive than the address of Prof. George E. Bailey upon Soil Hygiene, what soils are and how to keep them in good physical condition.

He recited the progress made by Colleges and Universities, as well as by private laboratories in chemical analyses of soils, plants, vegetables, cereals and fruits, and by the United States Bureau of Soils in the physical analyses of the same; the function of water in agriculture, which has been scientifically classified into the three distinctive ranks or divisions of gravity, capillary and film; the proper use of phosphates and nitre and the greatly increased abundance of crops produced by the action of selected microbes, bacteria and bacilli.

Deep plowing and the use of explosives for breaking up the underlying hard-pan have demonstrated that ground, thought to be worthless for agricultural purposes, may be made fertile for the yielding of bountiful crops.

The numerous questions asked of the lecturer evidenced the great attention with which his statements were received by many present, the representatives of the various agricultural interests of California.

Academy Meeting

On Wednesday evening, January 13, 1915, the Academy meeting was held in the Women's Club House on Figueroa Street.

Mr. Spalding reported that the National Academy of Sciences had selected Los Angeles as the place for its Convention during the coming Summer and, upon his motion, the President was authorized to appoint a Committee for the purpose of making suitable arrangements for the reception and entertainment of the visiting members of that Academy of Sciences.

Prof. F. P. Brackett, Director of Pomona College Observatory, related his experiences in Algeria as a member of the Expedition for measurement of Solar Radiation. His graphic descriptions were illustrated by many views of the instruments employed upon that occasion and of the people, cities, mountains and valleys of that interesting country.

HOLDRIDGE O. COLLINS,
Secretary.

Biological Section

The meetings of this section will be held during the year 1914-15 in the lecture room of the Los Angeles Public Library in the Metropolitan Bldg., at 5th and Broadway, on the first Tuesday of each month. The first meeting was held on the evening of October 6, 1914, at 8 o'clock. Professor Albert B. Ulrey, the new chairman, was the speaker of the evening. He alluded to the recent death of Dr. C. A. Whitney, who was chairman of the Section for several years. He then gave an account of the work of the Venice Marine Biological Station of the University of Southern California, telling something of deep sea conditions off the coast, and the recent researches. He also outlined the intended work of the Section for the year.

The second meeting was held on November 3. Prof. Ulrey, the chairman, made a report of some work at Venice. Sea urchins and starfish are becoming scarcer; may have to be protected. Mr. Barnhart, of the University, is studying the tuna question. Dr. Edwards reported the work of the nature study department of the public schools, of which he is supervisor. He is taking up the ideas of Joe Knowles, giving the children a knowledge of the injurious plants and animals. A nature study laboratory is to be established at the Olive St. School.

Dr. C. O. Esterly, of Occidental College, then made a very interesting address on the Food Problems of Fishes, with reference to his work on the copepods of the California coast. He discussed various theories proposed, especially that of Putter. Calanus and other copepods are largely used as food, and the probable food of these crustacea is the very small marine organisms—the coccolithophoridae, The chain is: Fish—smaller fish—copepods—micro-plankton.

The third meeting was held on the evening of Dec. 1, 1914. Prof. Ulrey announced the death of the eminent biologist, August Weismann, in Germany. Also speaking of a recent trip of the Biological Department of the University of Southern California in the launch, Anton Dohrn.

Dr. Wm. A. Hilton, of Pomona College, gave an account of the Laguna Beach Marine Laboratory of Pomona College, and of its past summer's work. He then proceeded to a very interesting account of the remarkable marine arthropods known as the pycnogonids; they are probably classified near to the spiders. He had numerous charts of all the known California forms to illustrate his full and illuminating talk. He discussed the classification, structure, the circulatory, respiratory, and reproductive systems of each species in detail.

F. Grinnell, Jr.,
Acting Secretary.

CAMPANILE OF THE MISSION INN

ARTHUR B. BENTON

Architect

114 N. SPRING ST., LOS ANGELES, CALIF.

BULLETIN

OF THE

SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

LOS ANGELES, CALIFORNIA

BULLETIN

OF THE

Southern California Academy of Sciences

JULY, 1915

Volume XIV, Part 2

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Astronomical Section

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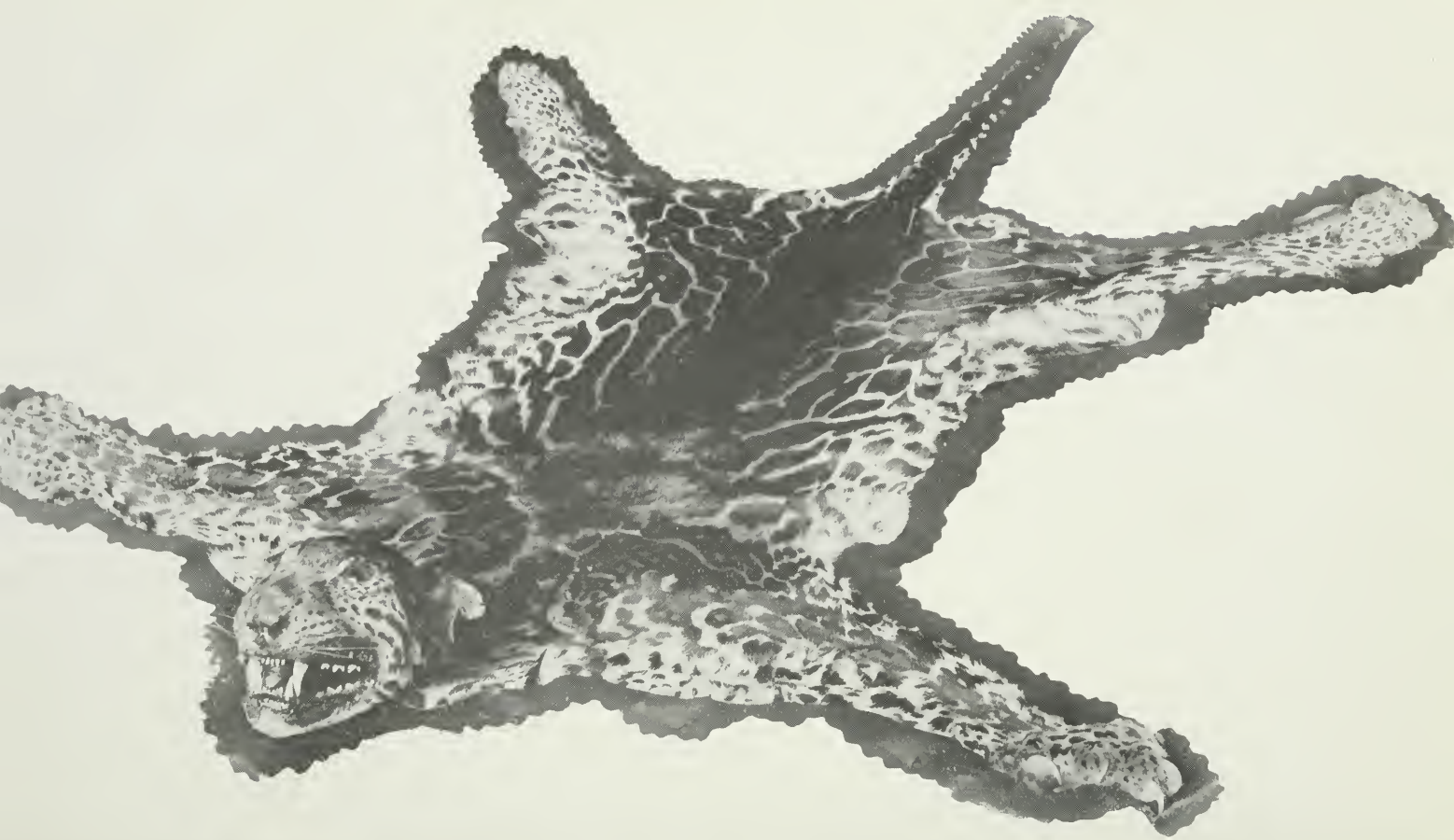

WHAT IS IT: *Felis pardus?*

EDITORIAL

In the Bulletin of the Seismological Society of America, Volume V, page 30, March, 1915, appeared an article entitled "Seasonal Periodicity in Earthquakes," by William A. Spalding. By permission of the Editor of that publication, we re-produce that article in this Bulletin.

Several years prior to the organization of this Academy of Sciences, Mr. Spalding, who was one of its Founders and who has served five terms as its President, became interested in the observations of Heinrich Samuel Schwabe,—an amateur Astronomer of Dessau, Germany,—from which was deduced a periodity in sun-spot phenomena. These labors of Schwabe were investigated by Prof. R. Wolf of Zurich, Stewart, De La Rue, J. H. Kedzie, and others, who published monographs upon the subject, but it was not until after a careful study of the theory of Equinoctial perturbation proceeding from the various planets of the Solar system, enunciated in 1875 by Prof. John H. Tice of St. Louis, Mo., that Mr. Spalding became so intensely absorbed in investigating the causes of seismological disturbances.

On December 22, 1892, five years before he first became President of this Academy, he read a paper before The Teachers' Institute in Los Angeles, in which he presented the conclusions to which he had arrived. His prediction of the time for a seismic convulsion was so positive, and the date of its occurrence was so exact, that, had these transpired during the darkness and superstition of the mediaeval periods, his voice would have been acclaimed one of prophecy; but, as has been

well said, "Mr. Spalding's predictions were based wholly upon scientific calculations. They were entirely devoid of any 'second sight' features or the popular 'inspiration' methods."

To understand Mr. Spalding's theory, which to many has ceased to be a theory and has become a demonstrated fact, this paper of 1892 should be read in its entirety, but some of its salient points may elucidate his ideas:

"If the equinox of our planet is powerful enough to give us periods of violent storms, it must make its effects felt proportionately to the earth's mass upon the sun."

"The equinox of Jupiter should be felt not only upon the sun, but in a reactionary way throughout the whole planetary system proportionately to the mass of Jupiter. . . . If the equinoxes of these two planets give direct evidence of their impress upon our great sea of force, why should not the equinoxes of the other planets have similar effects each in proportion to its mass?"

"And when two or three of these happen along with their equinoxes, is it not reasonable to infer that the disturbance would represent their joint energy?"

"As the periods of atmospheric disturbance are dependent upon the perturbing effects of the planets and as the movements of the planets and other perturbations are calculated by astronomy thousands of years in the future, so it will be possible to calculate tererstrial disturbance."

"We may even put our finger upon a date, a year, or ten years, or a hundred years, or a thousand years in the future, and say with reasonable certainty, that that year will be one of hurricanes, and tornadoes and floods and violent cold and earthquakes. And why shouldn't we? Astronomy is able to tell us what the position of a planet, millions of miles distant from our sphere, will be a thousand years hence."

In connection with the foregoing statements Mr. Spalding presented a chart showing that for the time from 1906 to 1909 the equinoxes of Saturn, Jupiter, Mars, the Earth, Venus and Mercury would occur in conjunction, thereby cumulating their electro-magnetic influences during that period, and he closed his remarks with these words, viz.:

"When this earth reaches the year of grace 1906, it will need to gird up its loins and prepare for a severe visitation. Here you see the equinox of Saturn is not merged gradually into that of Jupiter as before, but is almost exactly superimposed upon that of Jupiter, and the other planets drop into line, indicating that their disturbing influences will be united at, or near their maximum, and the electric tension of our planetary system will be raised proportionately. Then, if there is anything in this system, look out for something to pop."

We who lived in California in 1906 know how bitterly that prediction was fulfilled.

In further development of his ætiology, Mr. Spalding presented a paper—"Jupiter's Equinoxes and Sun Spots"—published in our Bulletin of July, 1909, (Vol. VIII, pp. 50-55), which revived interest in his predictions of 1892; and, from a careful study of those two articles in connection with his exposition in this Bulletin, it would appear that the conjunction of the equinoxes of the planets of our system, has been a powerful factor for seismal disturbances upon our Earth.

Holdridge Ozro Collins.

WANTED

Numbers of Volumes III, IV, V, VI of the Bulletin to complete files. Address the Secretary, Room 719, San Fernando Building, Los Angeles.

SEASONAL PERIODICITY IN EARTHQUAKES

By William A. Spalding.

Mr. Stephen Taber's study of earthquakes in the region of Charleston, South Carolina, during the period 1886-1913[1] is a valuable contribution to the data and theory of seismology. I am particularly interested in his discussion of periodicity in earthquake frequency, as that is a phase to which my attention has been directed during the past twenty years. Mr. Taber's curves are deduced from a monthly distribution of the 395 earthquakes under observation, and are analyzed mathematically for annual, semi-annual and quarter-yearly periodicities, using the methods adopted by Dr. Knott. The study is made more interesting by dividing the entire period into two epochs: first, 1886-1897, with its record of 318 earthquakes; and second, 1898-1913, with 77 earthquakes. While the investigator concedes that the number of earthquakes in the latter interval is too small by itself to be of value in determining periodicities, still the fact that the two curves thus separately deduced correspond closely in their characteristics lends additional interest to the study and is mutually confirmatory. This double testimony is again confirmed by curves based upon earthquake-days during the same intervals, thus eliminating a number of minor shocks and reducing the problem to a simpler basis. Mr. Taber's conclusions are as follows:[2]

"There is probably no real semi-annual periodicity in the earthquake activity of this region (Charleston, S. C.) Annual and quarterly periodicities are indicated, though the data are most too meager to determine this matter with certainty. However, the marked similarity of the different curves strongly supports the hypothesis that there are real annual and quarter-yearly periodicities."

My purpose in writing this is to institute another seasonal comparison, varying slightly from Mr. Taber's, but

[1] "Seismic Activity in the Atlantic Coastal Plain near Charleston, South Carolina," a paper read in part before the Le Conte Scientific Society at the University of South Carolina February 6, 1914, and published in the *Bulletin of the Seismological Society of America*, 4, 108, September, 1914.

[2] Ibid., p. 123.

utilizing the same data of monthly distribution. I divide the year into seasons relative to the earth's equinoctial periods, and the intervening solstices. This, of course, suggests a line of causation not considered by Mr. Taber in his paper, and involves a theory not yet established. Still it is worthy of investigation on a strictly physical basis such as I propose, and if periodicity is indicated empirically, we may bring forward the theoretical part of the discussion at leisure. I have merely to suggest at the outset that, the equinoxes themselves being periodical, if we succeed in allying earthquakes with them in any degree as effects or as concurrent phenomena, we shall have gone a long way toward solving the standing problem of seismic periodicity.

The vernal equinox occurs March 21st. Allowing that there may be some relationship between this occurrence and seismic action, it is fair to assume that the equinoctial influence begins some time before the actual event, and continues some time afterward. Let us assume, for convenience, that the period of greater or less equinoctial influence is three months, beginning February 1st and ending April 30th. This would allow 48 or 49 days before the equinox and 40 days after it. Granting this amplitude for the season of the vernal equinox, we should surely find indications of seismic increase or decrease within it if there be such a tendency developed in the curves.

In a similar manner we set off the months of August, September and October as the season of the autumnal equinox. The intervening seasons of three months each are allotted to the summer and winter solstices, and we have the year divided as follows:

Season of vernal equinox—February, March, April.

Season of summer solstice—May, June, July.

Season of autumnal equinox—August, September, October.

Season of winter solstice—November, December, January.

When we come to consider the year thus divided with respect to seismic frequency, the only striking variation from the plan usually in vogue is that the year begins with February, and January comes trailing along after December, as it in fact always does in the natural round of years. The advantage of this readjustment is simply to bring out in our diagrams the equinoctial and solstitial effects, if they exist, in stronger relief.

Re-drawing Mr. Taber's most typical curve from his plate 7 (that of total South Carolina earthquakes during the years 1886-1913), we have the following:

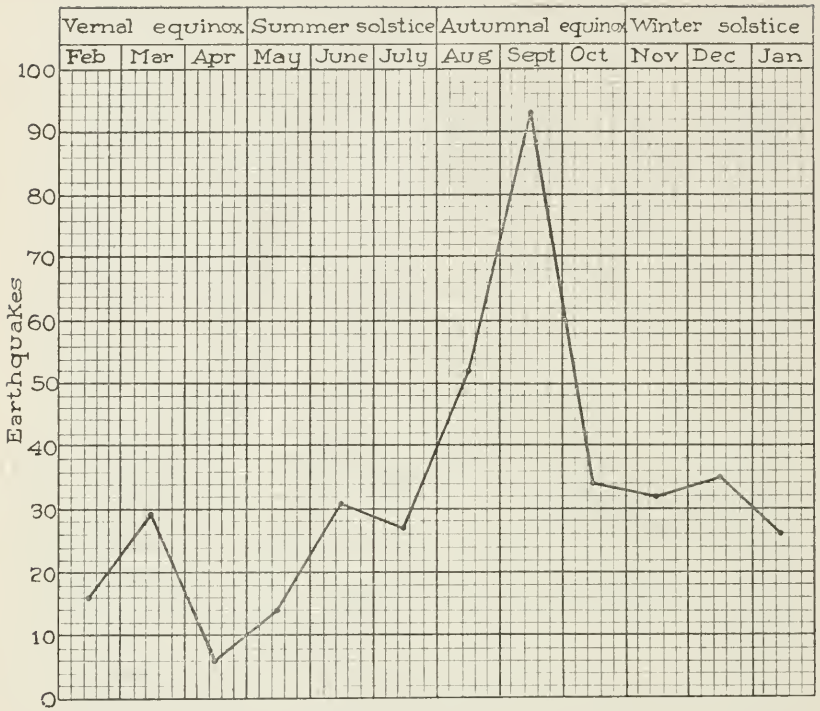

Fig. 1. Monthly Distribution of Earthquakes. Charleston Statistics. Total 395.

In figure 1 we have almost a facsimile of figure 5, plate 7, in Mr. Taber's drawing, but with our new adjustment of seasons the curve takes on an increased significance. In short, the line seems to be exactly fitted to the seasonal scheme. Here we have the maximum frequency in the middle of the period assigned to the autumnal equinox, and a minor rise in each of the other three seasons. The special advantage of this plan is that it is based on a previously assigned system; that this system is formed on well established periodic phenomena; that we may reproduce the formula for any year; that, if this concurrence of seismic frequency with the seasons assigned is sustained by a preponderance of testimony, it points toward a generalization of value, and that, behind that generalization, there may lie a good and sufficient reason for seismic periodicity.

Let us proceed to other statistics of earthquakes which may be subjected to the same test. The oldest table of seismic frequency by months which I have at hand is one quoted by Dr. Mallet in his treatise on earthquakes in the British

report for 1850, p. 66. It is referred to by Dr. Mallet as having been compiled by L. F. Kontz and originally published in the Allgemeine Encyklopädie der Wissenschaften und Künste, von Ersch und Gruber, Thiel, 36. This list, compiled by a German authority previous to 1851, comprehends a different series of earthquakes, and must be taken as independent of the data employed by Mr. Taber.

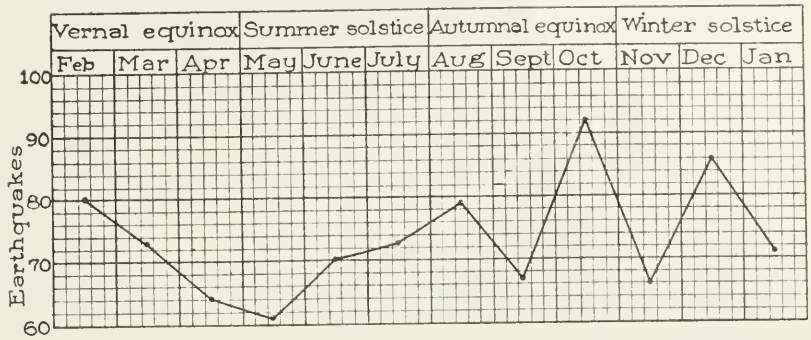

Fig. 2. Monthly Distribution of Earthquakes. German Statistics. Total 882.

Here we have a curve not so striking as that shown in figure 1 but still showing the same characteristics, with the maximum in the season of the autumnal equinox and minor rises in the three other seasons. It should be borne in mind that the old data employed, while gathered from a much wider field and comprising a larger number of earthquakes, is probably less reliable and complete. The curve formed upon the Charleston data, gathered in a single restricted and well defined seismic area, and doubtless more accurately compiled, ought to be the better testimony, furnishing the more typical curve.

For a third trial, we turn to another distinct and far-distant field, this time employing statistics compiled by Baron Dairoku Kikuchi, and published by the Japanese Imperial Earthquake Commission in its Report No. 19.

Here again we have the same general characteristics in a modified form and with sufficient variation to make the study interesting. Still the maximum point is in the autumnal equinox. See figure 3.

Again we shift the field and take data of Pacific Coast earthquakes from 1850 to 1887 inclusive, compiled by Profes-

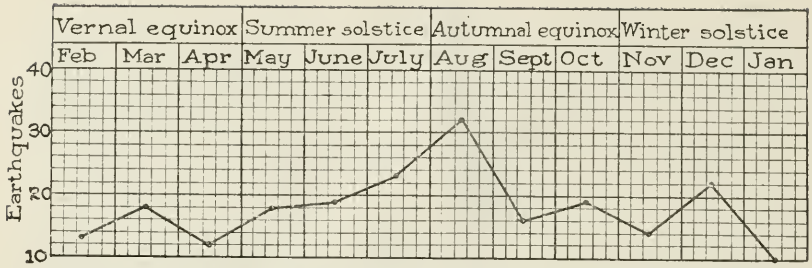

Fig. 3. Monthly Distribution of Earthquakes. Japanese Statistics. Total 216.

sor E. S. Holden and published by the Smithsonian Institution, 1898:

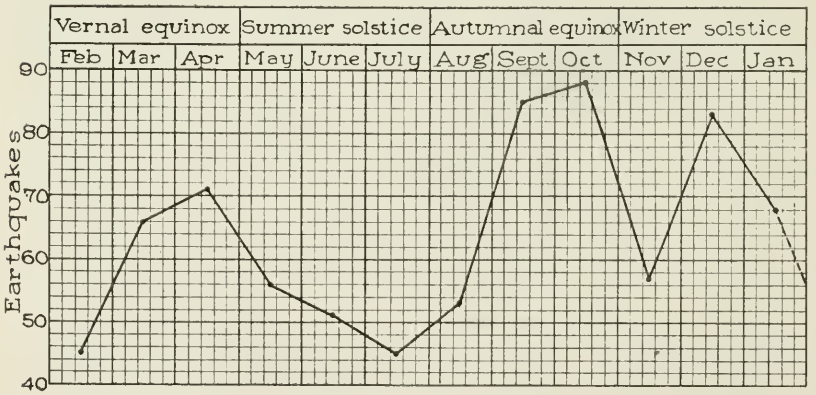

Fig. 4. Monthly Distribution of Earthquakes. Pacific Coast Statistics. Holden. Total 768.

In 1907 the Smithsonian Institution published Professor Alexander G. McAdie's "Catalogue of Pacific Coast Earthquakes from 1897 to 1906," as a supplement to Professor Holden's catalogue referred to above. Professor McAdie's catalogue includes the great San Francisco earthquake of April 18, 1906. Upon a monthly distribution of this list we obtain the curve shown in Fig. 5.

While we have given no extra value in the statistics to the earthquake of April 18th, counting it simply as one, the large number of after-shocks swells the record considerably for the vernal equinox and for all the later months. The uplifts in the curve for the vernal equinox and the summer sol-

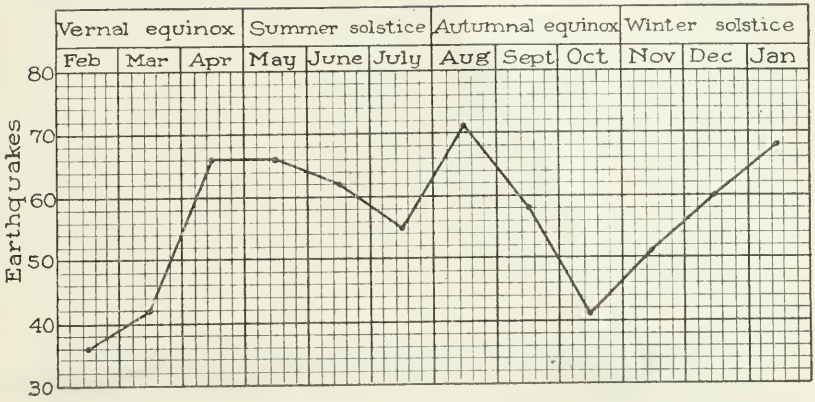

Fig. 5. Monthly Distribution of Earthquakes. Pacific Coast Statistics. McAdie. Total 676.

stice (figure 5) are exceptional, and might become confusing were it not for the special justification therefor.

We now venture upon the most extensive and most crucial test of all. From Mallet's "Catalogue of Earthquakes," published in the British Association Reports for 1852-3-4, I have collated monthly data of 5155 earthquakes, which occurred from 1600 to 1842 inclusive, the catalogue being based on authentic reports from every known field on the earth's surface. From these exhaustive data we obtain the following diagram.

This curve, figure 6, is strongly emphasized, but does not depart to such an extent from the characteristic line already developed as to form a contradiction. The minor rise in the summer solstice previously developed disappears, and is replaced by a decided minimum at that point. For this we had a precedent in figure 4.

In fact this latest development, figure 6, corresponds so closely in essential features with those previously secured that I feel warranted in making a composite of the whole series.

Figure 7 includes all of the statistics embraced in figures 1, 2, 3, 4, 5, 6.

Here is the summary of our study—the conclusion which must be relied upon to give the characteristic curve. If this curve has any significance, it is to show that there is some

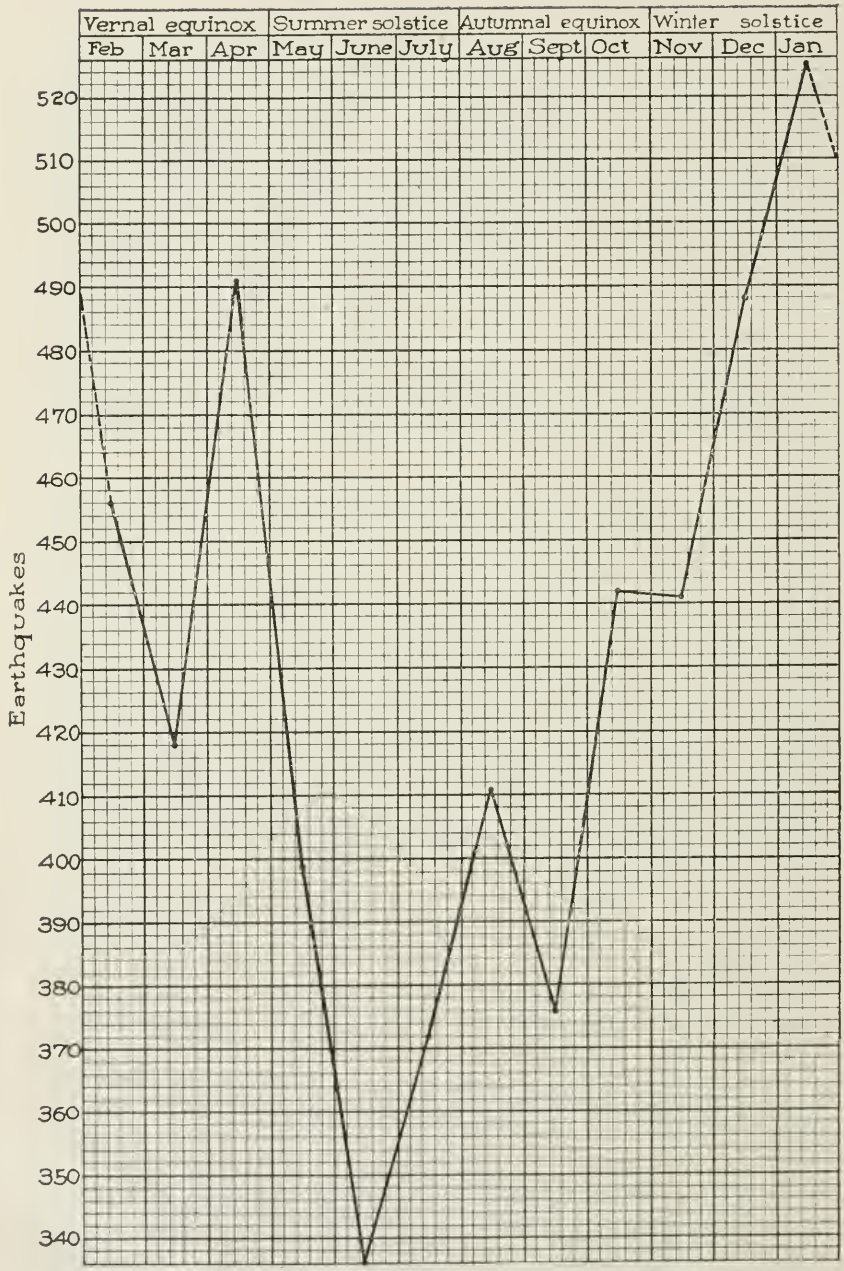

Fig. 6. Monthly Distribution of Earthquakes. English Statistics. Total 5155.

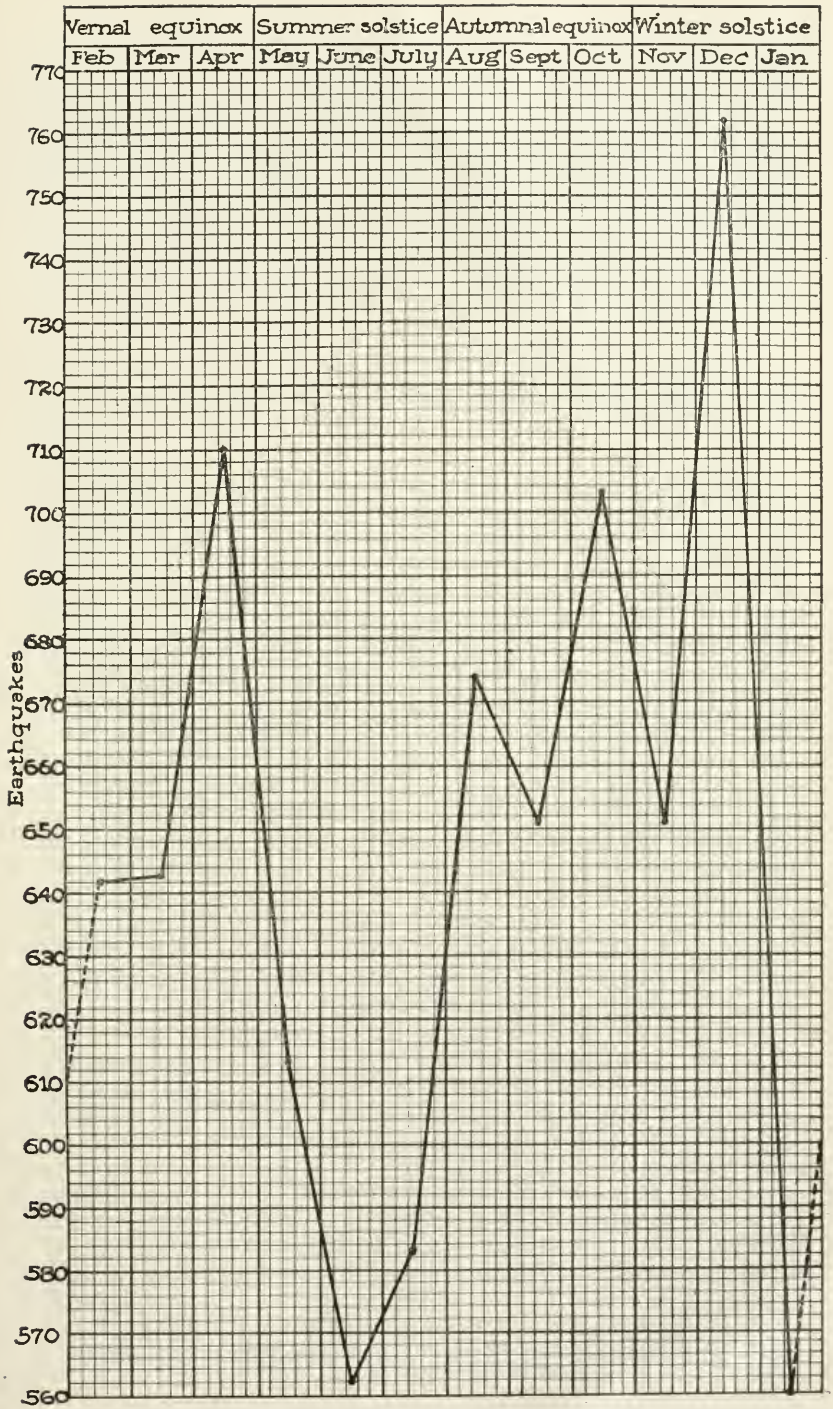

Fig. 7. Monthly Distribution of Earthquakes. Combined Statistics. Total 7754.

concurrence between the earth's solstices and equinoxes on the one hand and earthquake frequency.

In other words, whatever constant or measurably recurrent fluctuation may be shown to exist at those seasons points toward periodicity. Since the earth's equinoxes and solstices are simply phases in the inter-adjustment of the earth to the sun in the course of the earth's annual revolution, we are warranted in investigating those prenomena, to ascertain whether such readjustments may involve physical action that influences to some extent seismic frequency.

TERATOLOGY OF THE NAVEL ORANGE

By S. B. Parish.

Any departure from the normal character of a plant organ constitutes it a morphological monstrosity. In the navel orange there are two abnormalities: first, the absence of seed, and second, the presence of the so-called "navel."

Seedlessness occurs in a number of cultivated fruits, noticeably in the banana and the pine-apple. Among the citrus fruits there are seedless lemons and grape-fruit, as well as several varieties of oranges. In all these seedlessness does not prevent the vegetative growth of the fruit, which attains full development; but in other cases fruits having no seeds, or imperfect ones, drop prematurely, or never attain full size. Such a dwarfed fruit is the seedless "Zante currant" of commerce. When this vine is grown along with others which bear normal fruit, some berries by cross-fertilization will produce seed, and such grapes will be three or four times larger than the seedless "currants" on the same cluster. Unpollinated peaches either fall promptly, or if they persist are small and fleshless. In this connection it is to be noted that the navel orange is very subject to the dropping of its fruit soon after flowering, the loss from this cause amounting to a considerable percentage.

Seedlessness may be due either to inherent defect in the ovular organ, or to lack of pollination. In the latter case imperfect seed will probably be present, but in the former they will be wanting. The navel orange has been studied by Osawa, a Japanese botanist, and the valuable results of his investigations are presented in a recent report.[1]

Osawa finds that seedlessness in the navel orange is due "chiefly to the lack or sterility of pollen grains, and partly to the disintegration of the embryo-sacs." The breaking up of the pollen-mother-cells begins very early, and at the time of flower-

[1]Cytological and Experimental Studies in Citrus. By I. Osawa. Journ. Coll. Agric. Imper. Univ. Tokyo, Vol. 4, No. 2.

ing the anthers contain no pollen-grains and, indeed, do not dehisce.

The disintegration of the embryo-sacs is accomplished at a somewhat later period in their history than that at which it takes place in the pollen-sacs, but it also is complete before the time of flowering. Occasionally, however, a perfect egg-cell is produced, and it has been shown to be capable of fertilization by the pollen from one of the seed-bearing varieties of the orange. Such a Navel, thus pollinated, will produce one or more seeds. Experiment thus proves the correctness of the theory, empirically held by orange growers, that the presence of seed in a navel fruit is evidence that the tree on which it was borne was so situated as to permit fertilization from a seed sort. But as the orange flower is insect fertilized, and the orchards are much frequented by bees, the potent pollen may be carried from a distance of a mile or more.

Having ascertained the cytological causes which prevent the production of seeds in the navel orange, we are brought to the further inquiry as to how it acquired the seedless habit. But as the conditions under which the first tree or trees originated—for such a fruit may have originated more than once,—are not known, this question cannot be definitely answered. Seedlessness in various plants has been found to result from a number of different causes, among them hybridization and long continued intensive cultivation. In the absence of direct knowledge these may be regarded as the probable originating causes which led to the production of races of oranges, the Navel among them, in which the normal seed-bearing habit has been lost.

As the navel orange is incapable of seed propagation, it is evident that it can have no bearing upon questions of heredity; for heredity concerns itself with the transmission of qualities from parent to offspring. The navel orange is multiplied and distributed only by vegetative processes, and these artificial and dependent upon the mechanical agency of man; namely, budding or grafting. Every Navel tree, so far as the parts which grow from the bud or graft are concerned, is just as much a part of the parent tree as if it were a branch of it. They, therefore, possess the qualities of the parent, not by inheritance, but directly by physical identity, with it. Any essential modification of character could come only from bud-variation, which may occur in any bud, but which, should it occur, can be propagated only vegetatively. Since the occasional seed produced by a Navel is the result of cross-fertilization, a tree grown from such a seed would not be a navel orange, but a hybrid between the Navel and the staminate parent which contributed the pollen. In a tree of this ancestry characters inherited from either parent might appear.

The second abnormality is the "navel," which gives this orange its name. This consists of a small circular orifice at the

distal end of the fruit, within which are a few wrinkled and compacted flakes of epidermis. Such is the character of the fruits seen in the markets, but among those which are rejected by the packers are many in which this adventitious growth is greatly developed. In these examples the navel opening is enlarged and filled with rough, corrugated rind, which usually protrudes irregularly, sometimes taking the form of finger-like projections, which may be four or five inches long; and sometimes of an irregular globose body. When this last form is of good size it presents the appearance of an abortive orange fused to the end of the primary one.

The nature of this excrescence is obscure. It has been explained as being in reality the fusion of two distinct fruits, an explanation suggested by the appearance of the extreme globulose protrusions which often occur. Prolification cannot, however, be assumed in the case of the navel orange, since this would necessarily be preceded by a modification of the flower, whereas the flower of the Navel is regular in all its cycles. Osawa attributes the production of the "navel" to the multiplication of loculi and carpels, which eventually protrude from the end of the fruit. He compares it to a somewhat similar growth in some varieties of tomato, and considers both as results of high cultivation. "Splitting" of the orange, that is the opening of a crevice across the end of the fruit, a defect to which the Navel is subject at the time of ripening, is also attributed to the additional carpels, which, as they swell in ripening, exert a pressure too great for the strength of the epidermis, and rupture it. These explanations are not entirely satisfactory, but are the best that have yet been offered.

IS IT UNIQUE?

By Holdridge Ozro Collins, LL.D.

In the month of December, 1912, while I was in the City of Madras, India, I purchased from Mr. G. A. Chambers, a very peculiar and beautifully marked skin, the hair of which is nearly as fine and glossy as that of a dressed seal-skin, and which no Biologist, nor Zoologist to whom I submitted it for examination in Cairo and Vienna was able to identify.

The frontispiece hereto is an half-tone representation, made from a fore-shortened photograph. The skin is larger than that of a Leopard, but smaller than that of a full grown Tiger.

Mr. Chambers gave me a written statement which I now have, of which the following is a copy, to-wit:

"THE CHROME LEATHER CO., LTD.
TANNERS AND LEATHER GOODS MANUFACTURERS
REF. NO._____
TELEGRAPH PHONE "HIDES" No. 1
Retail Depot
MISQUITH'S BUILDINGS, MOUNT ROAD
TELEPHONE No. 363
MADRAS, 23rd December, 1912.
BOX 100

I, the undersigned, hereby certify that I am engaged in business in the City of Madras under the name of Chrome Leather Company, Limited, for the purchase, tanning and sale of hides, skins and furs, and I have been engaged in such business in Madras, India, during the last 19 years.

The animal of which this is the skin was killed in Malabar in South Western India, during the year 1912. Its unusual markings and beauty were strange to me and I was not able to identify it, so I sent it to the Government Museum at Madras for examination with my letter, of which this is a copy, viz.:

Madras, 1st May, 1912.

Dear Dr. Henderson:

I am sending per bearer a skin. Can you please tell me from what animal it has been taken? It appears to me to be a freak. Yours faithfully,

G. A. Chambers.

To the above note I received the following reply:

No. 314. Government Museum,
Madras, S. C., 1st May, 1912.

Dear Mr. Chambers:

The skin is an unusually fine one of the Leopard or Panther. It belongs to a variety of which I have never seen a specimen before. Yours sincerely,

G. A. Chambers, Esq. J. R. Henderson.

I have never before seen a skin of these peculiar markings and I consider it of great value and of a most rare animal.

G. A. Chambers."

I presented the matter to the authorities of the Smithsonian Institution, and I received the following communication, viz.:

"Smithsonian Institution
United States National Museum

Memorandum

March 2, 1915.

The skin * * * * appears to me to be that of a melanistic leopard. Melanism is not rare in this animal. Usually it shows itself as a general darkening, through which the normal markings can still be seen as under a heavy veil. In this individual, on the contrary, it is limited to the back, sides and tail, where it takes the form of an increase in area of the dark markings until these coalesce to form the ground color.

It is evidently a very beautiful skin.

Very truly yours,

Gerrit S. Miller, Jr.,
Curator, Div. of Mammals."

The wide black portion, which glistens like the sheen of silk velvet, extends from the top of the head to the extremity of the tail *entirely* free from any white or tawny hairs, but when photographed, the skin was placed upon a platform rising at an angle from the floor and it is fore-shortened in the picture, which does not do justice to its exquisite beauty. It appears from the photograph as if white or tawny hair were spread over the back at the shoulders, which is not the fact. The photographer states that this appearance was caused by reflection of the light from the white markings, as he was obliged to take the picture from an angle.

In the tiger, the stripes are black, of an uniform character, upon a tawny background, and they run in parallel lines from the center of the back to the belly. In this skin, the stripes are almost golden yellow, without the uniformity and parallelism of the tiger characteristics, and they extend along the sides in labyrinthine graceful curls and circles, several inches below the wide shimmering black continuous course of the back. The extreme edges around the legs and belly are white and spotted like the skin of a leopard. It was intimated to me in India that this animal may have been the progeny of a cross between a tiger and a leopard, but it is asserted by Zoologists that, although such a condition may exist in a state of captivity, it is impossible in animals *ferae naturae*.

From the authorities I have consulted; from personal interviews I have had with learned Zoologists who examined this skin, and from the statements in the communications hereinabove

given, it would appear that no one has been willing to assert positively from what creature this marvelously beautiful skin has come. Is it a freak, like a sport in botany, a hybrid, or a distinct species of the *genus felis*, which has lurked in the jungles of India, heretofore unknown to Science, like the lately discovered Okapi of the unexplored Stygian gloom of darkest Africa? All agree that it has characteristics of both the tiger and the leopard, but whatsoever may be ultimately determined as to its classification, I give credit to the belief that it is *sui generis*, and that nowhere upon this earth, either in public or private collections, whether embracing the limits of Zoology or the universal field of Biology, is its duplicate to be found.

When proper arrangements shall have been made for its safety and preservation, it will be placed upon exhibition in the Biological Division of the Museum in Exposition Park.

HABITS OF A CLEPTIS (WASP)

By A. Davidson, C. M., M. D.

The habits of the wasps of Southern California are all of peculiar interest on account of the widely divergent habits of individual species in the same genus.

There is around Los Angeles a wasp of the genus Cleptes (species undetermined) that I have hatched from the cocoon, but have never captured on the wing. The species is very small (less than one quarter inch long) and somewhat rare, so it is not likely to be found in many collections. This species nests in the hollow stems of small shrubs and prepares the larval beds by filling the bottom of the cavity with particles of earth, sand, grains, seed or any debris convenient; on this the food supply with its accompanying egg is laid; a layer of earth, etc., is put on top; this is repeated until 2 to 5 eggs with food supply, are deposited, as is the habit with many other wasps.

This insect is noteworthy in that its store of larval food consists of specimens of Coreidae, only one other species so far as I have observed has been discovered using these as food supply.

Why these common insects are not more frequently used by wasps I do not know, though I presume the acrid juice the majority of these insects exude, affects their palatability.

The larval cocoon is formed from sand and earth in its immediate surroundings. It measures one quarter inch in length, cigar shaped, rounded at both ends like those of the common sand wasp (Sphex). The wasp is one of the most industrious of the family.

The number of trips required to carry the sand, grains, etc., found in any of the nests, is always considerable, but what was necessary in the case of one nest in my possession, in which five cocoons were found and the earth particles, etc., weighed 60 grains, I leave it to the reader to imagine.

RANDOM BOTANICAL NOTES.

By George L. Moxley.

Calamintha mimuloides Benth.

September 7th, 1914, I found a single plant in Arroyo Seco Canyon. Not realizing that it was an uncommon find, I did not take much from it. Until quite recently I found no other record for Southern California. The records now stand, as nearly as I can learn, as follows:

Cottonwood Canyon, near Acton, Los Angeles Co., Cal., Aug. 23, 1893. Dr. H. E. Hasse, Zoe, iv. 287.

Bear Canyon, San Gabriel Mts., Los Angeles Co., June, 1897. J. H. Barber, No. 216, acc. to H. M. Hall, Zoe, v. 265.

Arroyo Seco Canyon, San Gabriel Mts., Sept. 7th, 1914. Geo. L. Moxley, No. 280.

Alisma plantago-aquatica L.

August 31st, 1914, I revisited the locality where I found this plant the previous year, as reported by Dr. A. Davidson in this Bulletin for July, 1914. This is on the Long Beach line of the Pacific Electric Railway, between Dominguez Junction and Cota Station. The plant is apparently becoming quite well established and will doubtless prove a permanent addition to our local flora.

Lactuca scariola L.

Early last year I first noticed typical *L. scariola* growing in the York valley, Los Angeles. The var. *integrata*, Gren. & Godr., is quite common. In June, 1914, I visited Yorba Linda, Orange Co., where I saw quite a number of plants, all of the typical form, growing near the station. I saw none of the var. *integrata* there. Since then I have seen the typical form more and more frequently in and around Los Angeles. It seems to be gaining a foothold and will likely soon be as common as the variety.

Picris echioides L.

This plant is established in quite a number of localities around Los Angeles. I have noticed it in Colegrove, on Angeleno Heights, and there is a patch covering an area of about a city block in the York valley. I also noticed about a dozen plants in Florence in May, 1915.

Silybum Marianum (L) Gaertn.

At Florence Ave. and the Long Beach tracks of the Pacific Electric, there is quite a good sized patch, with isolated plants scattered about for some distance.

REPORT OF THE SECRETARY

PRESENTED AT THE ANNUAL MEETING
OF THE
SOUTHERN CALIFORNIA ACADEMY OF SCIENCES,
MAY 19, 1915.

During the last year, have been held Three Meetings of the Board of Directors and Five General Meetings of the Academy, at which a wide diversity of subjects has been considered, to-wit:

1.

The Biological and Geological Works taught in our Public Schools.

2.

The Trend of Modern Thought in Europe.

3.

Soil Hygiene, what soils are and how to keep them in good physical condition.

4.

The Expedition to Algeria for measurement of Solar Radiation.

5.

Sedimentary Rocks and their Erosion.

These meetings have been enlivened by general discussions and musical presentations.

A pleasant occasion was the Banquet of October 17, 1914, attended by several of the Founders and Incorporators of this Academy, whose reminiscences of the early struggles for existence, and the final triumph demonstrated the truth of the now accepted dogma of "The Survival of the Fittest."

The Executive work of the Academy has been rather exacting:

The gentlemen of the Committee on Programme have been strenuous in obtaining lecturers of repute and ability in their several fields of activity.

Mr. Benton, the President, has devoted much valuable time to our interests, taken from a very taxing profession, and probably no one knows as well as I, the careful attention given by Mr. Keese to our finances, which has carried us through the year without leaving us in debt at this date. Most certainly this Academy of Sciences owes to Mr. Keese a hearty vote of thanks for his faithful and successful services.

On November 11, 1914, at Los Angeles, died Bancroft Etz Beeman, a member and a former Director of this Academy, and we were most profoundly impressed with his interest in our work, as we read from his last Will and Testament the following paragraph, to-wit:

"I give and bequeath to the Southern California Academy of Sciences, (of which I am a member at this date) the sum of *ten thousand* dollars, suggesting that said sum be loaned on good security, and that the interest thereon be used to defray the expense of free lectures, or other proper entertainments bearing on scientific topics."

In due course of administration of his Estate, this amount will be paid to our Directors, and the income therefrom devoted to the purposes designated in said bequest.

Our Bulletins continue to attract attention, particularly from Scientific Institutions, not only in our own land, but in Countries all over the world. I may mention that we have exchanges with various dominions of Europe, in Asia, Australia, Japan, the Philippines, the Argentine Republic, Cuba and Mexico, and no month elapses without requests from individuals and Libraries or Scientific Bodies, for copies of our Bulletins, particularly of the old issues. Our papers upon the Flora of California are the ones for which requests are most frequently made.

In former years, insufficient care to preserve extra numbers of the Bulletins resulted in the exhaustion of valuable parts of Volumes 3, 4, 5 and 6, and at this day the Academy has but four complete files of the Bulletin. We have three other files, lacking only certain numbers of the Volumes from 3 to 6. It is earnestly hoped, if any member of the Academy has numbers of these volumes, which are not desired for further personal use, that they will be transmitted to the Secretary, to be added to the incomplete Volumes.

The Bulletin is published but two times each year, January and July, and these two editions compose a Volume. If financial conditions shall so warrant, it has been proposed that the Bulletin be issued three times each year.

The Board of Directors deemed it proper and even necessary to have an office, centrally situated, for the transaction of the work of the Academy, and in April last, Room 719 in the San Fernando Building, corner of Fourth and Main streets, was rented, where the Secretary can be found during business hours. To this place were conveyed all the Bulletins we have, and many valuable volumes of reference and exchanges, but the bulk of our Library remains in the Museum Building in Exposition Park, where it was transferred in 1912. The present business headquarters are not large enough for its shelving.

During the time of the concession to the Academy by Mrs. Ross, for excavations in La Brea Rancho, many complete skeletons were found and mounted, and they are now upon exhibition in the Museum. In addition to these, thousands of fossils were exhumed, partially cleaned and boxed, and they now repose in the basement of the Museum building and marked as the property of this Academy. There are some among us who

hope to see this Academy of Sciences the owner of its own Building to which these valuable, most interesting and in some parts, unique remains from the Quaternary Age may be transferred, mounted and placed upon exhibition. As to the ownership of these fossils, excavated from La Brea Rancho I refer the inquirer to the action taken by the Board of Directors on July 3, 1912, reported on page 88 of the Bulletin, Volume XI., No. 2, of date July, 1912.

A very fine tiger skull, with sabres about 10 inches in length, protected by a plate-glass case, may be seen at any business hour in the Academy Room at the San Fernando Building.

HOLDRIDGE O. COLLINS,
Secretary.

TRANSACTIONS OF THE ACADEMY.

Academy Meeting.

The monthly meeting of the Academy was held on February 16, 1915, in the Friday Morning Club House. President Benton presided.

The speaker of the evening was Prof. W. L. Watts, whose topic was "Sedimentary Rocks and Their Erosion." His subject was illustrated by many excellent lantern views showing the sedimentary rocks in the making, with microscopic demonstrations of their structure, and of deep sea diatoms and minute animals and their skeletons: Erosion by sea waves, glaciers, rivers, rains and winds, and their agency in destroying and returning to the sea the rocks originally built in the ocean depths.

The lecture was followed by a musical program from Prof. Anton Dahl, the following named numbers being given with splendid technique and great feeling:

C Sharp Minor Sonata ..... *Beethoven*
Adagio
Allegretto
Presto Agitato

Thunder Storm in Norway ..... *Anton Dahl*

Bridal Procession ..... *Grieg*

Melody in F ..... *Rubenstein*

Etude in C ..... *Rubenstein*

Hungarian Rhapsodie ..... *Liszt*

Directors' Meetings.

At a called meeting of the Directors, held in the office of the Treasurer on Tuesday, March 9, 1915, there were present Messrs. Benton, Collins, Davidson, Keese, Parsons, Spalding and Watts.

The following named persons were elected members of the Academy, viz.:

I. S. Hurst and Robert C. Gillis of Los Angeles, Prof. Frank P. Brackett of Claremont, and Professor, Doctor Josef von Hepperger, Director of the Sternwarte in Vienna, Austria, was unanimously elected an Honorary Member.

The Committee appointed on December 3, 1914, to select a design significant of the work of this Academy, to be used on printed matter and stationery, presented an impression from the plate of the design selected.

The design was approved and adopted for the Academy publications. An impression from said design is annexed.

The Treasurer reported the financial condition of the Academy and asked that an auditor be appointed to examine all future accounts against the Academy before payment. His request was granted and the Secretary was appointed such auditor of accounts.

The Secretary presented an extended report of the conduct of his office; of the numerous requests made for complete sets of the Bulletin and for individual numbers; the unsatisfactory condition in which valuable scientific works were now kept and the danger of their loss unless suitable provision be made for their protection. Following an earnest discussion of the situation the Secretary was authorized to rent a centrally located room, which shall be used for storage purposes and an office for the Academy, the rental price for which shall not exceed Seven Dollars and Fifty Cents per month.

The President appointed a Committee, consisting of William A. Spalding, B. R. Baumgardt and George W. Parsons, to represent this Academy of Sciences at the meeting to be held from August 2 to August 7, 1915, in San Francisco, of the American Association for the Advancement of Science, and to make arrangements for the entertainment of any members of that Association who may visit Los Angeles during the coming summer.

Board adjourned.

A meeting of the Directors was held on Wednesday, May 19, 1915. Present, Messrs. Benton, Collins, Davidson, Keese and Parsons.

Dr. P. C. H. Pahl of Los Angeles was elected a member of the Academy.

The Secretary reported that pursuant to the direction of the Board at its meeting on March 9, 1915, he had rented Room No. 719 of the San Fernando Building for the use of the Academy, at the rate of Seven and One-half Dollars per month, and his action was approved.

Mr. Keese presented his accounts as Treasurer for the year 1914-1915 and asked that a Committee be appointed to examine the same and report their findings at a future meeting of the Directors. The President appointed Messrs. Parsons and Collins as the Committee.

Board adjourned *sine die*.

Annual Meeting.

The Annual Meeting of the Academy was held on Wednesday evening, May 19, 1915, in the Auditorium of the Friday Morning Club House. President Benton presiding.

The Annual Reports of the Secretary and Treasurer were read and ordered filed, and Reports were received from the Botanical, Geological, Zoological and Astronomical Sections.

A communication from the Pacific Division of the American Association for the Advancement of Science, inviting members of this Academy to join said Pacific Division, was read.

The Ballot taken for Directors for the ensuing year resulted in the unanimous election of the following named gentlemen, to-wit:

Hector Alliot	Samuel J. Keese
George H. Beeman	William H. Knight
Arthur B. Benton	George W. Parsons
Holdridge O. Collins	William A. Spalding
Anstruther Davidson	Albert B. Ulrey.

William L. Watts

Mr. James T. Armstrong from England, read a paper upon "Potash Production in Southern California," giving statistics relating to its production in the United States and the large quantities heretofore imported from Germany. Owing to the great demand for potash in the manufacture of explosives, as a fertilizer and in various branches of Science, the United States faces a larger economic problem than is generally realized. The war in Europe has deprived us of the usual imports from Germany. There is no potash on the market and no prospect appears of there being any for a long period. The price has jumped from $35.00 to $150.00 per ton since the commencement of that war. Germany and the Pacific Coast and perhaps Japan are the only practical sources from which potash can be produced. There is a necessity for immediate home production, and it can be manufactured from the superior quality of our Pacific Coast kelp at a price and in quantities to compete with the Japan and German product.

Our Government is now doing all in its power to encourage the manufacture of potash on the Pacific Coast, as the conditions reported from all potash-producing countries seem to indicate that, eventually, all potash must be produced from kelp.

A vote of thanks was tendered to Mr. Armstrong for his very interesting discourse, and the meeting adjourned.

Directors' Meeting.

The Directors elected for the ensuing year held their first meeting on Friday, June 4, 1915, in the office of Mr. S. J. Keese. Present, Messrs. Alliot, Beeman, Benton, Collins, Keese, Parsons and Watts.

The election for officers resulted as follows, viz.:

President	Arthur B. Benton
First Vice-President	William L. Watts
Second Vice-President	Anstruther Davidson
Third Vice-President	Hector Alliot
Treasurer	Samuel J. Keese
Secretary	Holdridge O. Collins

The President appointed the following Standing Committees, to-wit:

Publication—Collins, Davidson, Spalding.

Finance—Keese, Spalding, Beeman.

Program—Knight, Watts, Parsons.

The Committee appointetd to examine the accounts of the Treasurer for the year 1914-1915 reported that the itemized statement of the Treasurer, presented at the last Annual Meeting of the Academy, was correct in every item, and on motion the Annual Report of the Treasurer and his accounts were approved and confirmed.

The following communication was read by the Secretary, viz.:

Vienna, April 30, 1915.

The Secretary of the Southern California Academy of Sciences.

Sending you my kindest acknowledgments for the amiable notification of my election as an Honorary Member of the Southern California Academy of Sciences, I beg you to be so good as to convey to the Academy my sincerest thanks for the distinction bestowed upon me.

Yours very gratefully,

J. von Hepperger.

Upon adjournment the members were entertained at lunch in the University Club by Mr. Keese.

Holdridge O. Collins,
Secretary.

Botanical Section.

The Botanical Section of the Southern California Academy of Sciences met on Thursday evening, April 22, 1915, at 8 o'clock, in the Music Room of the Los Angeles Public Library.

Dr. Anstruther Davidson, Chairman, presided. The following men were present: Davidson, Payne, Moxley, Life, H. H. Tracy, Munk, Burlew, Beardsley, Sherb, Patton, Lewis, Collins, Knight, Bancroft, Dimmick and Grinnell.

Dr. Davidson exhibited and briefly commented on several new introductions and recent collections, among which were: Lepidium perfoliatum, Githopsis diffusa, Malacothrix clevelandi, Dondia californica, taxifolia and suffrutescens, Gnaphalium purpureum, Calochortus Campestris and C. discolor, the last two described in the January number of the Bulletin.

Mr. G. L. Moxley showed and spoke of several recent collections: Alisma plantago aquatica, about which there is some confusion; Calamintha mimuloides, from the Arroyo Seco canyon; Godetia, Clarkia, and Echinodorus cordifolius.

Theodore Payne exhibited a lot of new introductions: Anigozanthus manglesi, from Australia; Hakea suaveolens, laurina, and Saligna, Amorpha fruticosa, Illicium anisaturn, Colletia cruciata, Corumbium populifolium, Clethra arborea from Maderia; Agophora, Phillyreea, Lesbania grande, Mahernie, Carissa grandiflora, and a bunch of native wild flowers.

Prof. A. C. Life exhibited a specimen of Orobanche from San Gabriel canyon, and spoke of a white Oenothera mutation.

W. Scott Lewis showed some beautifully colored lantern slides of wild flowers. Mr. Stanley F. Patton announced that he was beginning the study of the grasses and sedges.

Meeting adjourned at 9:30, to meet on the fourth Thursday evening of each month in the same room.

The second meeting of the Botanical Section met in the Music Room of the Los Angeles Public Library May 27, 1915, at 8 o'clock, with the following persons present: Dr. Davidson, chairman; Payne, Lewis, Life, G. H. Grinnell, F. Grinnell, Jr., Burlew, Davis, McDanial, Billson, Foster, Stewart, Towne, Misses Gertrude Donnelly, Charlotte Albrecht, Leona Browning, Mrs. Lou De Armond, Mrs. L. Maude Albrecht.

Mr. W. Scott Lewis showed a photo of a specimen of Calochortus clavatus with five petals—a colored drawing. There were eleven stamens—lacking one of being normal; two extra petals and there were two pistils. The specimen is preserved in Dr. Davidson's collection.

Dr. Davidson presented a specimen of Silene multinerva and one of Helianthus gracilenta from Santa Susanna Pass, and spoke of the possibility of discovering other interesting plants in this little worked locality; also a specimen of Orobanche californica.

Prof. A. C. Life showed a specimen of Darlingtonia californica (Torrey), speaking of its structure and adaptations to an insectivorous habit.

Mr. G. H. Grinnell showed a specimen of Corallorhiza trifida, and a sphagnum moss from Massachusetts. Mr. W. Scott Lewis exhibited an album of colored photos of wild flowers.

Mr. Fred E. Burlew exhibited two large albums of most beautiful and perfect plant photographs, all made by himself.

Mr. G. H. Grinnell, the latest edition of Gray's Botany, of the North Eastern States.

The botanical journals received by the library were placed on the table, where they were examined by those present, and informal discussion indulged in till 9:30, when the meeting adjourned.

F. Grinnell, Jr.,
Acting Secretary.

Zoological Section.

It is with grateful appreciation that we acknokledge hereby the very generous contribution to the material of the Zoological Section of the Academy, of Dr. John S. Comstock's very rare and valuable collection of North American Butterflies. This collection contains several thousand specimens, including nearly a complete list of all known species in North America, and several new forms from Dr. Comstock's research work. The scientific way in which this collection is prepared and labeled makes it a trustworthy and reliable guide in the identification of additional specimens, and of great interest to the scientific collector and student in original research work. The Academy is greatly indebted to Dr. Comstock and gladly welcomes him into the Association of the Academy's honored members.

We further report and offer a collection, now in preparation, of several hundred specimens of San Fernando shells, including about a hundred different species. These shells were secured by your chairman from the foundation of the present Clark's Hotel, and they are regarded with considerable interest, since collections from this formation are rare.

It is hoped that at an early date these and other collections for this department of the Academy's work may be placed so as to be available for inspection and study.

May we ask that the members of the Academy report to the Secretary or Chairman of the Section, possible contributions which might be secured to increase the already commendable beginning.

J. Z. Gilbert, Chairman.

Southern California

Academy of Sciences

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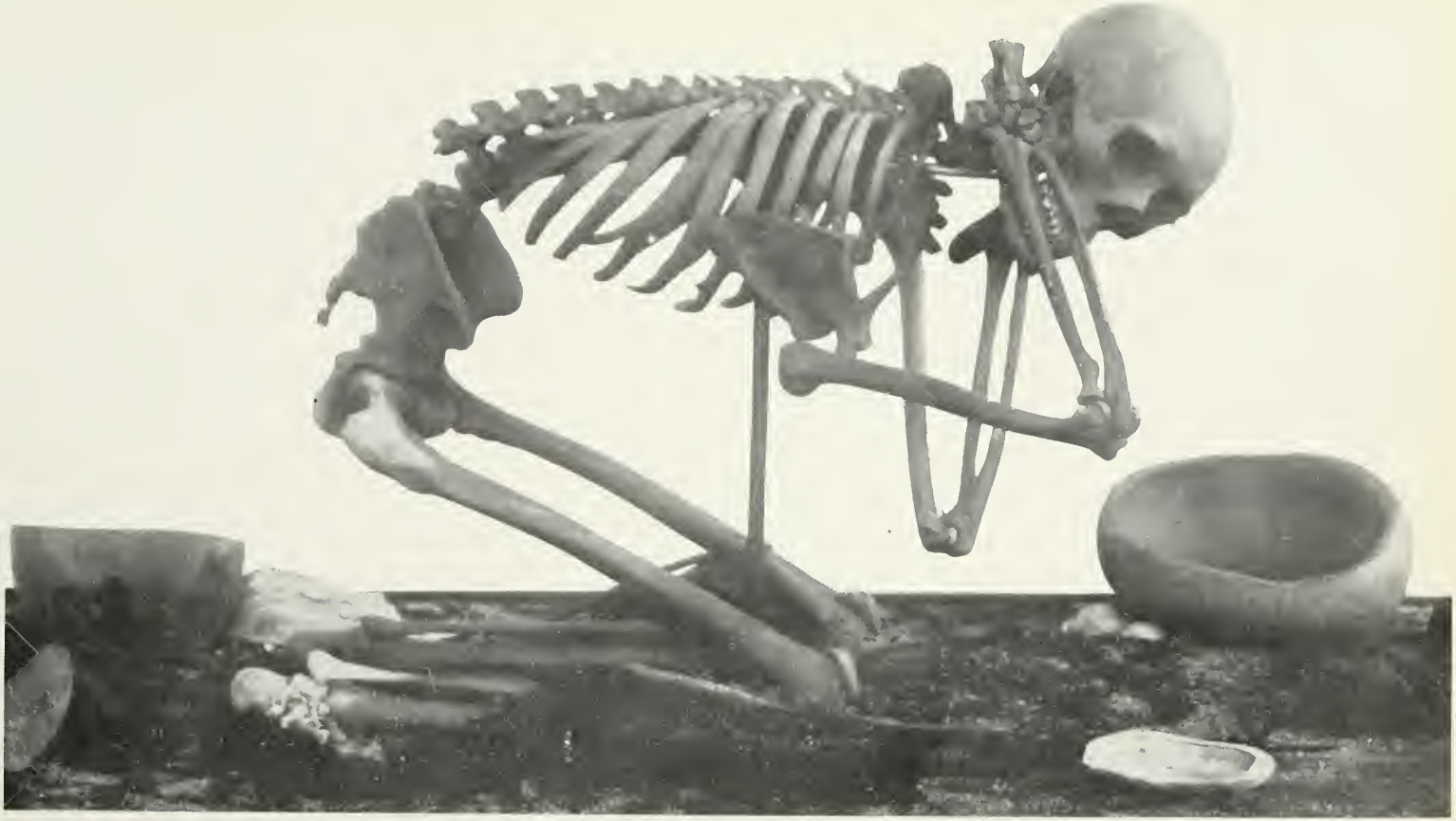

LATE TECHNOLITHIC AGE MORTUARY PRACTICE
SAN NICOLAS ISLAND, CALIFORNIA

EDITORIAL

AT the November meeting of this Academy, Professor Hector Alliot, Curator of the South West Museum, related to a large and intensely interested audience the story of his excavations upon Santa Catalina and other Islands, resulting in the discovery of heretofore unknown phases of the Ethnology of the ancient dwellers of the Channel Islands.

His graphic account of some of his discoveries, presented in this Bulletin, will attract the consideration of all, and especially of those whose attention has been called to the rather romantic habitat; and perhaps a domestic *modus vivendi* of those ocean dwellers who were undoubtedly a people more warlike and of a higher order of intelligence than their neighbors on the adjoining main land.

The half-tone frontis-piece herein, is made from a photograph taken of the remains as they were exhumed from their grave upon San Nicolas Island.

Dr. F. M. Palmer of Los Angeles, whose paper in our Bulletin of January, 1909, attracted so great attention to the study of the Indian tribes of the Pacific coast regions, passed his summer vacations during many years upon these Islands, and the result of his labors is an accumulation of matter, illustrating that ancient ethnology which has no equal in the world. The Smithsonian Institution tried in vain to obtain from him certain of the products of his excavations, which were pronounced absolutely unique by the Scientific world: But, like, the discoveries of La Brea Rancho, it was considered that these evidences of a civilization, *sui generis*, should be retained in the land of their home, and the most tempting offers were declined.

They are now safely deposited in the South-West Museum,

scientifically classified and arranged for exhibition in a very pleasing and satisfactory manner.

Professor Alliot's Archæological and Ethnological investigations have not been confined to the pre-historic races of our Pacific Coast and the adjoining islands. He has devoted an exacting study of the Cliff dwellings of Arizona and New Mexico, and most strenuous labor in exploring the almost inaccessible homes in those great gorges, whose origin is so concealed in the untranslated records of the immense eons of the past, that no one can say with certainty that these tremendous mountain gashes were caused by erosion, seismic disturbances or volcanic convulsions. Some of the results of these labors were exemplified by an illustrated discourse upon "Our Archæological Inheritance," before the Academy on February 11, 1911.

In our Bulletin for January, 1912, we presented a paper by Prof. Alliot upon "Primitive Eugenics." It was confined principally to the marriage regulations of the Seri Indians of Tiburon Island and the adjacent coast in the Gulf of Mexico, and, as stated by the Editor, it was the first time this subject had been treated in a Scientific publication on the Pacific Coast. We were surprised at the attention which this paper attracted and the ultimate material result of its publication. Eugenic societies were organized and notices were frequently read in the newspapers, of lectures upon this modern branch of Science.

It is a subject upon which, as Sir Roger de Coverly remarked, "much can be said on both sides," and Prof. David Starr Jordan, President of Stanford University, in a discourse upon Eugenics, delivered before this Academy upon April 6, 1912, took a very pronounced position in opposition to the practice.

WE find it a mournful duty to record herein the loss of members who have reached their journey's end, passing along that great thoroughfare which we all must travel. Not one of them but had achieved distinction in his chosen avocation, and they all had done something to make life sweeter and lovelier for their companions and associates. The only thing we can do is to pay our weak tribute to their worth, but for those who have crept silently to rest,

"The Moving Finger writes; and, having writ,
Moves on; nor all your Piety nor Wit
Shall lure it back to cancel half a Line,
Nor all your Tears wash out a Word of it."

At Los Angeles, on March 31, 1914, departed this life Thomas Augustus Rex, M. D., for many years a modest but zealous member of this Academy. His life was devoted to his profession and, at the close of the War of the Rebellion, he was Acting Assistant Surgeon of the United States Army.

He received his Degree from the University of Pennsylvania, and establishing himself in Philadelphia, he became distinguished in the Medical fraternity as a Physician and Surgeon of unusual ability and attainments.

In 1905 he retired, and, coming to Los Angeles he made a new home for his little family; and his gentleness, courtesy and enlarged information won for him the affection and respect of his neighbors and associates.

Theodore B. Comstock, Ph. D., who died at Los Angeles on July 26, 1915, was distinguished not only as one of the most reliable geologists of the country, but as an instructor and a scientist of great executive ability in the educational field. During the years from 1875 to 1879 he was Professor of Geology and Paleontology in the Department of Economic Geology, founded by him in Cornell University.

In 1891 he organized the Arizona School of Mines in the then Territorial University, and after a service of four years as Professor and Director, he was elected President of the University, which office he held for two years.

Soon after coming to Los Angeles, he became identified with this Academy of Sciences, and early in its history he was elected a Director, and in our first Bulletin of the present series, 1902, his name appears as a member of the Committee on Publication. On May 17, of the same year he was elected President, which office he held for two terms. He was the energetic Chairman of the Geological Section, and his papers upon the Geology of the Pacific Coast, published in our Bulletins, were received with great interest by the Scientific bodies of the United States.

In 1910 he was induced to accept the office of Secretary and Chief Engineer of the Los Angeles Board of Public Utilities, but the position was distasteful to him, and in 1912 he resigned.

By the death of Right Reverend Thomas James Conaty, D. D., J. U. D., this Diocese and the Roman Catholic Hierarchy of the United States have lost a most strenuous advocate of the creed of his Church, an executive of great ability and a theologian, profoundly learned in the casuistry of his religious faith.

Born August 1, 1847, at Kilnaleck, County Cavan, Ireland, he was ordained priest on December 21, 1872, at the Grand Seminary, Montreal, Canada.

He was Rector of the Catholic University of America, from 1896 to 1903, during which period he was consecrated Titular Bishop of Samos. On March 27, 1903, he was named Bishop of Monterey and Los Angeles, which incumbency he held until his death on September 18, 1915, in this city.

He was a member of this Academy for several years. He was distinguisred as an educator and for the establishment of parochial schools upon the tenets of his religion.

The great activity and advanced prosperity of the Roman Catholic Church in this Diocese are a monument to his zeal and executive proficiency.

Born, 1857, in Clarksville, Tennessee, Frank Middleton Coulter, after graduating from the South West University, entered the dry-goods firm of his father and uncle, B. F. Coulter and Brother.

In 1877, with his father he came to Los Angeles, where his father built up the great dry goods company which bears his name. Upon the death of B. F. Coulter, his son Frank became the principal factor in the management of that great establishment.

He was a public-spirited man, liberal in his contributions to aid the distressed and needy, and probably he had an acquaintance more extended than that of any other person in Los Angeles.

He died from heart failure on October 26, 1915.

Herman E. Hasse, died on October 29, 1915, at the Soldiers' Home near Santa Monica. Born on January 12, 1836 in Freiburg, Saxony, when nine years old he was brought to the United States by his parents, who settled in Milwaukee, Wisconsin. He studied for the Medical profession, in St. Louis, Missouri, and later in several of the Universities of Europe, receiving the Degree of M. D. in 1861, from the University of Wurzburg, Germany. Returning to the United States the same year, he was commissioned Second Assistant Surgeon in the Ninth Wisconsin Regiment of Infantry, and he served four years of the War of the Rebellion, retiring from the army in June, 1865, with the rank of Surgeon ,and the praise and gratitude of his commanding officers, for his most devoted labors in ameliorating the sufferings of the sick and wounded.

He commenced private practice in Milwaukee, whence he went to Arkansas and Missouri, but in 1885 he brought his family to Los Angeles, where he resumed his professional work. In 1888 he was appointed Chief Surgeon of the newly established Soldiers' Home, and he gave most valuable work in the organization of that Institution for those who, like himself, had tendered their all for the preservation of the integrity of this Nation.

In 1905 he resigned this responsibility and, retiring from the practice of his profession, he entered the Scientific field of Botany, devoting his principal studies to the lichens of the Pacific Coast. In 1913, the Smithsonian Institution published

his work, "The Lichen Flora of Southern California," which gave him in both Europe and America, a distinction in the field of Botany, equal to that achieved by Dr. Harkness, of San Francisco, and our Dr. Davidson of this Academy.

Our early Bulletins contain many papers by Dr. Hasse upon the lichens of California, of whose study he was a pioneer, and by his death we shall miss a valued contributor, and the students of Botany have lost a Captain in Science.

Dr. Hasse was a lover of our Country, and in him, though a German by birth, was no hyphenated loyalty to the land of his adoption; its civil polity, social customs and educational Institutions. He had no room in his heart for a system of "Kultur" differing from that as practiced in our United States.

Holdridge Ozro Collins.

WANTED

Numbers of Volumes III, IV, V, VI of the Bulletins to complete files.

Address the Secretary, Room 719 San Fernando Building, Los Angeles.

BURIAL METHODS OF THE SOUTHERN CALIFORNIA ISLANDERS

By Hector Alliot, S. D.

History and romance invest with interest the three islands composing the Santa Catalina group, off the shores of Southern California.

It seems fairly well established that the primitive habitants who first greeted the sight of the Spanish navigators were daring and brave warriors, far more spirited and courageous than the natives of the mainland.

Numerous implements found from time to time establish the fact also that a highly developed primitive culture obtained upon the thickly populated islands.

For years Santa Catalina, now world renowned for its marine gardens of Avalon and its famous fishing grounds, San Clemente to the southwest, and the smaller San Nicolas have been the favorite exploration fields of scientists and the curious visitors. The abundant material discovered in numerous burial sites has proved of fascinating interest to students of the stone age artifects of the Pacific Coast. These discoveries, while valuable, were somewhat casual, and more the result of chance than serious effort.

Recently more systematic work has brought to light a great variety of objects, which form the links of an evolutionary chain of culture little known before.

In attempting to secure specimens that would lead to a better knowledge of the manufacture of early fishing implements and other utensils, the recent expedition of The Southwest Museum to San Nicolas had the good fortune to discover a new form of burial not heretofore recorded. It seems to complete the cycle of mortuary customs of the pelagic people of the islands, from a pre-columbian period to that of the occupation of the land by the white settlers, and the gradual evanescence of the native tribes.

William Herman Golisch, in charge of the expedition, secured also an important geological collection of the island, besides minor techno-lithic objects of great interest. These finds, however valuable, are secondary in importance to the discovery of a new form of primitive burial.

The success of the Golisch party's mission was largely due to the length of time spent on the island, a period of six weeks, rendering possible systematic and reliable observations. Few persons had heretofore cared to remain for more than a few days at a time on the inhospitable, wind-swept spot, where archaeological work cannot be successfully prosecuted without the constant protection of veils and goggles. Even thus

equipped the work is accomplished under difficulties. Violent sand storms constantly pelt one with grit and pebbles, and fill with drift the partly opened trenches.

Three complete skeletons in excellent condition were secured and many fragmentary specimens, confirming two distinctive methods of burial.

In June, 1914, the unusual severity of the early spring storms had uncovered a vast burial field, comprising over a hundred graves, on the northerly plateau of San Nicolas Island. The disturbed condition of the burial sites prevented any systematic observations of all the remains, partially unearthed and again covered by a peculiar formation of sand affected by sea spray and salt-laden winds, composing a hard, resisting crust, over which loose sand is being continually heaped and shifted.

Protruding from the hard, salt-incrusted sand talus, the posterior parts of three skeletons were observed, partly exposed, and bleached by the action of the sun and wind. Owing to the fact that the original positions appeared to have been undisturbed by the elements they seemed to represent the normal forms of burial, and were selected as museum types for careful exhumation and study.

The first skeleton found, that of a female, has been installed in the hall of the Southwest Museum in Los Angeles, California; the second, a male, has been temporarily placed on exhibition at the San Diego Panama-California Exposition, as the Museum's contribution to that most important display of Southwestern ethnology ever attempted. The third, also a male, will be placed in the Museum later.

Buried in the ferruginous earth all three skeletons had taken the distinctive brownish color characteristic of the remains of that region, the bleached whiteness of the exposed portions presenting a striking contrast.

The positions of the three skeletons were the same, more than twenty less complete specimens showing a uniform mode of interment. The dead had been laid, not horizontally, but crouched in a ball, the lower limbs drawn toward the head, in the posture so quaintly described in the "Relation des Jesuites" of 1636 concerning the burial customs of the Hurons; "Quasi en la mesme posture que les enfants sont au ventre de la mère." (In the same posture that a child has in his mother's womb.) The head in each case was slightly turned toward the East, the left hand closed and placed near the left ear, the right—holding in its grasp a beautiful white quartz crystal sufficient in size to fill the palm—resting on the right ear. About the neck was a circlet of large bits of charcoal. At each of the cardinal points a fire had been kindled; south of each skeleton had been placed a broken stone bowl and pestle, north of it shells and ornaments.

In the case of the female skeleton the lower maxillary was held in place by a lance head of black quartz, six inches in length,

retaining traces at its base of the asphaltum with which it had been attached to a shaft. The latter, however, was not present. This extraordinary feature did not exist in the case of the two males, nor in any other burial observed, and opens an interesting field to conjecture.

In eleven other graves investigated the arrangement of the skeletons was different. Instead of the four fires, four bodies had been interred at the cardinal points about one in the center. This phase of the islanders' burial was first brought to the attention of the writer in 1909, and again in 1913, when a grave was unearthed on San Nicolas Island, containing seven bodies laid in a circle about a central one.

Owing to the mutilation of some of the skulls found in such graves, the theory has been advanced that this peculiar form of mortuary custom was adopted especially for the disposal of the remains of those fallen in battle, and represented some distinct ritualistic war practice. Although the injuries to the crania are to all appearances accidental, further and more conclusive observations may at some time determine this point more clearly.

The practice of kindling the four fires—without the use of a grave post—was probably imported to the islands, as it is common among many Indian tribes. An Algonquin legend tells of the necessity of building fires about the dead to illumine their way to the land beyond. A returned good soul having finally instructed the living that four fires only were necessary, since the journey consumed but that many days. The mystic number of four fires is also associated with certain Mexican mortuary customs. Emil Bessels, of the Polaris Expedition, noted a similar practice among the Esquimaux.

It is more probable that the use of symbolic fires in the burial of the latter day San Nicolas Islanders came to them from the Yurok Indians of northern California. Stephen Bowers recorded that the Yuroks built fires about the graves, for they believed that death was a passage over an attenuated greasy pole "which bridges over the chasm of the debatable land, and that the souls of the departed require fires to light their way on their darksome journey. A righteous soul traverses the pole quicker than a wicked one, hence they regulate the number of nights for burning a light according to the character for goodness or the opposite which the deceased possessed in this world."

The San Nicolas burial custom, according to all observations, seems to be more closely related to that of the Yurok than to those of its closer neighbors of the mainland, the Luiseños and Diegueños, who used only one fire in their mortuary clothes and image burning ceremonies.

In the cases of these mainland tribes the use of fire seemed to be only a means of accomplishing the essential ritualistic cre-

mation of the garments and the images, without any special other significance attached to the fire itself.

With the San Nicolas islanders the kindling of four fires at the cardinal points would indicate a well determined symbolical and ritualistic purpose, rationally accounted for by Algonquin and Yurok traditions. This burial custom is different from the one of the coast region lying nearest the Santa Catalina group of islands, variant also to the practices of other islands lying north or south of Santa Catalina, San Clemente and San Nicolas.

While the use of four symbolic fires can be adduced to Yurok influence, since the Santa Catalina islanders were known to have voyaged northward as far as Monterey Bay and may have come in frequent contact with the tribes of that region, the use of the quartz crystal is associated with the Diegueños and the Luiseños cultures.

J. P. Harrington in recent reports concerning his observations on that symbolical object, satisfactorily explains its employment in the mortuary practices of the Santa Catalina Indians. He states that it was mounted on a ceremonial staff of bone or wood, and sometimes carried unmounted. In Diegueño it was called "kutatawi," and "paviut" in Luiseño. It was believed to have been born of the Earth as were the First People. Not a made thing but one of original creation, which possessed the power of rending asunder the hardest substances. It was also endowed with the magic potency to open for its possessor the way through any obstacle made of rock or wood, becoming, therefore, an ideal symbolic object in mortuary ritualism.

This new evidence would seem to confirm the claim that a highly developed center of culture obtained on this particular group of islands partaking of but strongly deferentiated from that of the tribes on neighboring islands or surrounding shores.

This theory is sustained by the finding, in the burial sites unearthed, of steatite bowls, incised and inlaid with bird-bone sections arranged in geometrical patterns and set in asphaltum; carved ornaments and small figures of foxes, ground squirrels, whales, flying fishes and dolphins, together with highly finished implements of slate and other stone material, carved bird-bone beads, wampum from the purple hinge of the norrissia norrissii shell, and numerous abalone shell ornaments of artistic forms.

Of the burial sites on the mainland thus far explored, the artifects found do not generally show the same high character of craftsmanship. When objects of unusually fine form and finish are found, they are usually of steatite, indicating that they were very probably obtained in exchange from the Santa Catalina artificers, as this material comes exclusively from the Santa Catalina quarries, and is not known to exist elsewhere on the Coast.

These recent finds of the Southwest Museum Expedition

have the value of clearing up, in a measure, the superficially conflicting yet authoritative observations made since 1873.

Schumacher, Stephen Bowers, H. C. Yarrow, A. L. Kroeber and others have reported the finding of skeletons buried in a crouching position; they make no mention, however, of the symbolical fires, their observations evidently referring to earlier, more primitive types than the ones just found.

That this more cultured form of burial was not reported before is probably due to the fact that former expeditions to San Nicolas have limited their activities to the sandy grave sites near the easily accessible eastern shore of the island. During the protracted stay of the Gelisch party, the high northern plateau, furthest distant from the landing harbor, and necessitating tedious journeys under difficult conditions, was thoroughly explored. The result was the discovery of this higher type of independent aboriginal culture than any hitherto known to have existed on the Santa Catalina group, before the advent of the white man.

NEW AND INTERESTING RECORDS OF BUTTERFLIES IN AND ABOUT LOS ANGELES.

By Fordyce Grinnell, Jr.

1. *Nathalis iole Boisduval.*—Several specimens of this pretty little species have been taken near Sycamore Grove and other places by different boys. It is noted for its erratic appearance as to time and place, but is usually found in the late summer and fall.

2. *Callidryas eubule Linnaeus.*—Always common during the summer and fall months in the parks and gardens. The caterpillar is found on *Cassia*, and the chrysalids have a peculiar red and brown dimorphism, which is not understood or explainable. Also the sexual or other variation of the butterflies is not understood by authorities.

3. *Argynnis callippe Boisduval.*—Several specimens taken last spring (1915) by Fred King in the Highland Park hills. Rare near the city, now, though formerly abundant. More common on the coast north of Santa Monica.

4. *Pyrameis carya* var. *muelleri Letcher.*—Specimens taken during 1915 by Harold Burkhardt, George Farly and Fred Hadden, all in Los Angeles. The writer possesses seven specimens with dates as follows: November, 1914, April, July, 1915, and July, 1915 by Karl Skolfield. The seeming increasing abundance of this form described as an aberration might indicate a species in process of formation; although there is some variation, there is constancy in essential characters. This form is significant and needs to be studied and watched in succeeding years.

5. *Euptoieta claudia Cramer* or *hegesia Cramer.*—George Farly raised three fine specimens of this species from caterpillars which he found on cultivated pansy in his garden in Highland Park on Avenue 41. This is a rare species in this vicinity. Victor Duran has taken it.

6. *Eudamus proteus Linnaeus.*—Numerous specimens of the long-tailed skipper have been taken in the city during the summer of 1915, by different boys. Also from Long Beach and Baldwin's Ranch. This seems to be a periodic butterfly, as it has not been recorded for several years.

ALLIUM BURLEWII, N. SP.

By Anstruther Davidson, C. M., M. D.

DRABA VESTITA

Bulb coats somewhat smooth, non reticulated and fragile; leaf solitary, flat and falcate ⅛ in. wide; scape terete 3 to 4 inches high, shorter than the leaf; bracts three, broadly ovate, sharply accuminate; pedicels about 15, flowers light rose, the lanceolate segments entire ¼ to ⅜ in. long, slightly longer than the pedicels, stamens exserted, their filaments not dilated or only very slightly so in the free portion; stigma trilobed but undivided; crests inconspicuous.

This plant is abundant on Mt. San Antonio, where it was collected this season by Mr. Fred Burlew. About 500 ft. from the summit on the moist slopes exposed by the retreating snows it grows in large patches. I believe it has been heretofore confounded with *A. bisceptrum* on account of the exserted stamens, but Mr. Standley, who kindly compared it with that species, says it is different. No. 3000 Type in author's herbarium; cotype in Smithsonian.

Draba vestita, n. sp.—Caulescent perennial densely clothed with branching hairs, leaves obovate or oblanceolate closely im-

bricated at base; stems simple or branched, stems branching from base upwards very leafy; petals white, narrow strap-shaped equalling the sepals and inconspicuous, stamens exserted; mature fruit 6 to 8 lines long on pedicels of less than half their length, style prominent, straight, about 2 lines long, fruits not contorted or only occasionally convolute.

The type of this species was collected on the top of Mt. San Antonio by Mr. Burlew. In the month of July Mr. F. Grinnell brought the same plant from Mt. San Gorgonio. This plant has passed as Draba corrugata Wats. The latter is well represented by the specimens found on Mt. San Jacinto. These show a less hirsute plant, more lax in habit with conspicuous petals and markedly corrugate pods, which are in marked contrast to this species with its apparently apetalous flowers, and tufted habit. From a note sent by Mr. F. J. Smiley from the Gray Herbarium it would seem that both Draba corrugata and D. vestita are represented on Mt. San Gorgonio.

Type No. 2995 in author's herbarium. Co-type in Gray herbarium.

THE TECATE CYPRESS.

By Charles F. Saunders.

In the Bulletin of the Southern California Academy of Sciences for January, 1914, there appeared an interesting paper by Mr. S. B. Parish concerning a peculiar cypress growing on Mount Tecate, San Diego County. Mr. Parish's account was based on observations of trees growing in the bottom of gulches within easy access of the automobile road which skirts the base of the mountain on the north side. In such situations he found the cypress to be a slender tree at most twenty feet in height, but saw no seedlings or very young specimens, nor on the other hand any which might be termed aged, nor the remains of old trees. He was informed, however, that on the summit of the mountain, several hundred specimens were growing, apparently of great age, and with trunks two and three feet in diameter; but as an ascent of the mountain was impracticable from the high road, this report could not be confirmed.

Finding myself recently in the vicinity of Tecate, I visited the mountain, and spent a day upon its slopes and summit with the view of studying the distribution of the cypress. The result may be of interest as supplementing Mr. Parish's account.

Tecate Mountain, whose height is given by the U. S. Geological Survey as 3890 feet, is without trails and uninhabited,

but I was fortunate in encountering a young man, Mr. Oliver Bergren, who has a homestead at the southeastern base at the Mexican line. He knew the mountain thoroughly, having for several years hunted over it, and was familiar with the cypress. He and his brother-in-law interested themselves at once in my errand and were kind enough to conduct me to the nearest grove.

A Tecate Cyprus growing on the north slope of Mt. Tecate, San Diego County California.
Height 14 feet; diameter of trunk at the ground, 3¾ inches.

and pointed out in a general way the area—perhaps 100 acres—over which, they said, the tree is growing. I found it occupying only the dry, thin soil of the north side, disposed in small groves and clusters, its upper limit being at about 2500 feet elevation above the sea. At that line, the growth stops short; and thence to the summit, which I ascended from the north, not a single specimen was seen, and the summit itself was equally treeless. Nor could I discover any evidence that trees had ever occupied the mountain top, which on all sides is very rocky, and clothed with a chaparral, some two or three feet in height, consisting mainly of manzanita, Rhus ovata, Chamaebatia, and Adenostoma fasciculatum. Fires, however, have within recent years swept the entire mountain—the last, I was told, having occurred about seven years ago—so that the present covering is of late growth. Formerly the brush cover must have been much heavier, as I noticed charred stumps of manzanita half a foot through burned even with the ground, from which thrifty sprouts have arisen. It should be recorded, however, that Mr. Frank Stephens of San Diego, states positively that when he visited the summit in 1903, he found on a gentle slope immediately north of the crest, a grove of many old cypresses, low-branched and gnarled, and the trunks in some cases fully two feet in diameter near the ground.

Looking down the north slope from the upper heights, the clumps of cypress can easily be distinguished by the lively green of the foliage, standing out from the surrounding chaparral; and all trees examined presented the same bright, vigorous appearance noted by Mr. Parish in his paper, with mature fruit abundant. The extreme height observed was about 25 feet, the maximum of trunk diameter at base being about 5 inches. In the upper part of the belt (to which my observations were mainly confined) there was an abundance of seedlings and young saplings in various stages of healthy growth from 6 inches upward. Specimens were growing not only in the bottom of the gulches, but upon intervening ridges as well. In many places amid the growing trees, were the dead trunks of those which fire at some former time had killed, but in no case did I notice that these old trees were of greater size than living ones. The postmaster at Potrero, who knows the trees well and has fought fire on Tecate for many years, informed me that in 25 years he could not see much difference in their size, so slow is their growth.

The gregarious habit of the cypress in the midst of chaparral made it impossible to secure a satisfactory photograph of any individual, but a scrutiny of the accompanying print will perhaps give a hint of the general appearance of the tree. The time of my visit was October 30, 1915.

Following is an extract from a letter of Mr. Stephens, dated November 14, 1915. He visited the summit of Tecate in 1903, when engaged in painting some government monuments

that mark the United States-Mexico boundary line, which crosses Tecate Mountain.

"The summit is crescent shaped, the two horns forming ridges running southeasterly and southwesterly from the main summit, with quite a deep gulch or cañon between. Monument 247 is about half a mile west of No. 246; each is about 3400 feet altitude, and the main summit is three or four hundred feet higher. I left my horse at No. 246 and went directly across the cañon to No. 247, returning by the same route. I saw *no* cypress this trip. On the return trip several weeks later the inspector decided to remain with the horses at No. 246. I left my field glasses with him so he could inspect my work. I decided to try going around the ridge over the main summit. On the crest or rather on a gentle slope immediately north of the crest I passed through the cypress grove. My memory of them is not very clear, but I am sure they were large old trees—not erect, but, as might be expected on a wind-swept summit, spreading, low-branched and gnarled. I feel sure that some were two feet in diameter of trunk near the ground. The grove is on a sort of narrow flat, as I remember it, and probably cannot be seen a quarter of a mile away in any direction, as the mountain drops off rather steeply. It is possible of course that the fire may have extended to the summit and burned all the trees. In returning from No. 247 to No. 246, I went directly across the cañon as I found the brush around by the crest very thick and difficult.

"The most practical way now to get to the summit would be to go to Tecate by rail and then follow near the line of the monuments to the summit. Probably the old trail could yet be found. It is a good day's work to go to the summit and back. There is no water on the mountain."

TWO NEW ZAUSCHNERIAS.

By George L. Moxley.

Zauschneria glandulosa, sp. nov.—Stems slender, decumbent to sub-erect, about 2 dm. high, beset with numerous short-stalked glands; leaves lanceolate, sessile, sparsely villous with soft white hairs, more or less denticulate, not fascicled in the axils; calyx-tube cylindrical to narrowly funnelform, 10-14 mm. long, sparsely villous and somewhat glandular at the scarcely globose base; petals exceeding the calyx-lobes; stamens and style well exserted; capsule about 20 mm. long, densely glandular with short-stalked glands.

Described from a specimen collected on a "ridge south of Strawberry Valley (about 6500 ft.), San Jacinto Mountains, California. September 9th, 1914," by Winifern W. Swarth, No. G. L. M. 460. Type in Los Angeles County Museum of History, Science and Arts.

This species in foliage somewhat resembles *Z. latifolia* Greene, but the floral character is very different. The flowers are much smaller, more slender and of a very deep scarlet. It is perhaps one of the daintiest Zauschnerias.

What seems to be very much like this specimen was collected in Sequoia National Park, Davidson 1687, July, 1908, but the plant is small and just coming into flower, so that it is difficult to place definitely. I have, however, tentatively included it here.

Zauschneria viscosa, sp. nov.—Stems erect, much branched, 4 dm. high or less, the entire plant sparsely villous with short hairs, becoming almost glabrous with age, slimy viscid, but not glandular; leaves sessile, thin, broadly ovate, abruptly narrowing to a more or less accuminate tip, fascicled in the axils, calyx-tube glabrous, 20-25 mm. long, cylindrical about 10 mm. above the scarcely globose base, then abruptly broadening to the funnelform throat; petals about 10 mm. long; stamens exserted somewhat less than the length of the petals; capsule sessile, somewhat hirsute but not glandular.

Summit of ridge near Barley Flats, San Gabriel Mountains, Los Angeles County, California, Geo. L. Moxley 412, July 21st, 1915. Type sheet in my herbarium; duplicate in herbarium of Southern California Academy of Sciences.

This is very close to *Z. latifolia* Greene, and perhaps may prove to be only a well marked variety, but the extreme sliminess of the entire plant seems to me sufficient to differentiate it from all other species of Zauschneria, even though it were otherwise identical. But the calyx of *viscosa* lacks the globose base of *latifolia*, the petals are shorter in proportion to the length of the flower, and the stamens less exserted. Therefore I prefer to consider it a distinct species.

TRANSACTIONS OF THE ACADEMY.

Directors' Meeting.

A meeting of the Directors was held on Thursday, September 30, 1915. All were present except Mr. Knight.

The discussions were principally devoted to the matter of the finances of the Academy and resulted in the adoption of a Resolution authorizing the Treasurer to borrow one hundred dollars, if he shall find it necessary for the interests of the Academy and to pledge for the repayment of said loan any of the securities owned by the Academy.

Board adjourned.

Academy Meeting.

The lecture season of 1915-16 was commenced on September 30, 1915, by a Banquet in the University Club in Los Angeles, President Benton presiding.

Addresses were made by Dr. Bridge, Mr. Baumgardt, Prof. Alliot, Dr. Haughton and Mr. Spalding.

The remarks of Dr. Bridge led to a general consideration of the future course of the Academy, especially relating to the proposition of securing a permanent home, centrally situated; constructed to include a hall for our assemblies and an exhibition chamber for the display of our valuable mounts and articulated fossils from La Brea Rancho excavations, and other scientific collections now reposing in the Museum at Exposition Park.

This matter has been discussed by our Directors and at general assemblies of the Academy for several years, but at this meeting it assumed a practical and concrete business problem, and Mr. Spalding was appointed to organize a Committee, of which he shall be Chairman, to devise ways and means for achieving this object.

The following Resolution, proposed by Mr. Parsons, was unanimously adopted, to-wit:

Resolved, That the Southern California Academy of Sciences hereby endorses and pledges its support to the Hornaday plan for the making of Game Sanctuaries in portions of the National Forests that are unsuitable for the grazing of domestic stock and for agriculture; and we hereby request our members of Congress to aid in enacting the plan into law.

The great interest in the discussions of the evening, manifested by the lady guests, resulted in an expression of the desire on their part that similar meetings around the Banquet Table might be called during the season and, though no action was taken upon the matter, the idea was unanimously and most cordially recommended to the Board of Directors for their consideration.

At a late hour the meeting was adjourned.

Academy Meeting.

The Academy meeting on November 2, 1915, was of unusual interest, and a large audience listened with absorbed attention to the address of Professor Hector Alliot upon "The Customs of the Stone Age on Catalina Island."

Professor Alliot has devoted much time in exploring the Channel Islands of the coasts of Santa Barbara and Los Angeles Counties, and he has brought to light much of the Archaeology of these regions and

Ethnology of the pre-historic people whose homes were so securely isolated in the Pacific Ocean.

One of his discoveries was a manner of interment, hitherto unknown; and the material results have been a rich harvest in stone, wood and bone, which has been placed upon exhibition in the Southwest Museum, of which he is Curator.

Academy Meeting.

On December 15, 1915, in the Friday Morning Club Auditorium, at the regular monthly meeting of the Academy, Mr. Edmund Mitchell gave an address upon Cambodia, its ancient and modern geographic limits, the economic conditions of its people, with graphic descriptions of its ruined temples and palaces which have been buried in almost impenetrable jungles since the ninth century.

Holdridge O. Collins, Secretary.

Botanical Section.

The Botanical Section held the first meeting of the season 1915-16 Thursday evening, October 28th, in the music room of the Public Library. Twenty persons were present.

Dr. Davidson showed some specimens collected by Miss Mohr on the North Fork of the San Gabriel River.

Mr. Moxley showed a few plants collected by him in the San Gabriel Mountains. A pleasant and profitable hour was spent in discussing various plants presented.

The second meeting of the Botanical Section for the season was held November 18th, a week earlier than the regular time, on account of Thanksgiving Day. Forty-two persons were present.

Dr. Davidson presented a number of plants collected by F. Grinnell, Jr., on Mt. San Gorgonio. Among them was a new Draba to be described soon.

Mr. A. J. Perkins showed some specimens collected by him on Mt. San Antonio.

Miss Mohr presented several specimens from Big Basin, Santa Cruz County.

Dr. Davidson then spoke very feelingly concerning Dr. H. E. Hasse, by whose recent death this Section has been robbed of an enthusiastic botanist and a kindly gentleman.

The meeting then informally adjourned and a little time was spent in getting acquainted. An earnest invitation was extended to all not already members to join the Academy.

Geo. L. Moxley, Acting Secretary.

BULLETIN

OF THE

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Southern California Academy of Sciences

JULY, 1916.

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EDITORIAL

THE term Diatom embraces two Greek words meaning "cut through," and composes one of the five orders of the Algae, —of the confervoid class.

The Diatom multiplies by spontaneous division, and belongs to the higher organisms of differentiated protoplasm, possessed of the vital properties of animal as well as of vegetable cells, the so-called "physical basis of life." It is of microscopical minuteness and is found as fossils and in the ocean and fresh water.

A curious and perhaps amusing subject for discussion among biologists has been the theory advanced, that the Diatom belongs to the animal rather than to the vegetable kingdom, by reason of its hermaphroditic property of reproduction or multiplication, even though in some species, like the *Pleurosigma* and the *Navicula crabo*, there seems to be a middle rib or vertebra.

To the expert microscopist, the study of Diatoms affords a most absorbing attention. The investigation of their exquisite beauty in form and color, is a never-ending delight, and the revelations by a magnification of even 1500 diameters of the hexagonal lace work in *Pleurosigma angulatum*, of which thousands may be seen in a drop of water from the point of a pin, inspire amazement in the observer.

In our Bulletin of January, 1908, Miss Sarah P. Monks presented a very interesting paper upon Diatoms, beautifully illustrated from greatly magnified photographs made by our accomplished Treasurer, Mr. Samuel J. Keese, and in this issue we include a most interesting article upon the same subject by Dr. F. C. Clark, which we recommend to all who have access to a powerful microscope.

OUR profound sympathy is extended to the family of Edward Wolsey Coit, who departed this life on September 25, 1915, at the City of Los Angeles.

He was born at Plattsburg, New York, July 27, 1837, the son of Rev. Joseph Howland Coit, and from his early years he was identified with the various departments of the iron industry, from the rudiments up to the highest technical perfection.

When quite a young man, responsible interests of the old firm of Morris, Tasker & Co., of Philadelphia, the first manufacturers in this country, of wrought-iron pipe and tubing, were intrusted to him, and later, he became President of the Reading Iron Works of Pennsylvania, and associated with W. R. Hart & Co., who were noted for their great properties in the Lake Superior iron-ore region.

He was an officer of the National Tube Works Company before it became a part of the Steel Trust, and, coming to California in the year 1900, he became officially interested with the Oil Well Supply Company of Los Angeles, which association continued until the day of his death.

Notwithstanding his great activities in the commercial world, his studious youth and his technical pursuits of later life, attracted him to several branches of the sciences, and, becoming a member of this Academy, he took an active interest in our proceedings.

We shall miss him from our meetings.

David R. Brearley died at Los Angeles on January 5, 1916.

He was one of our prominent citizens, and for many years he had been active in all measures instituted for the welfare and prosperity of the city.

He was a member of this Academy and his interest in our work was manifested by his subscription of one hundred dollars towards our endowment publication fund.

We condole with his family upon their great loss.

IN the Bulletin of January, 1915, were given the names of those who served this Academy of Sciences as Presidents from the time of its foundation down to the present date, and, in an earlier issue, were inserted the portraits of William H. Knight and Theodore B. Comstock.

In this issue will be seen the portraits of the other gentlemen who, successively, as our chief presiding and executive officer, have given their time and labors so devoted to our interests, that they have made our Academy a prominent factor for the encouragement and progress of study and investigation on the Pacific Coast, in all branches of Science.

The tableaux as published, are complete with one exception: The first President was Dr. M. H. Alter, who left Los Angeles many years ago, and died in Philadelphia. An earnest effort has been made to discover a friend or relative from whom a photograph could be obtained, but we regret to announce that there has been no success in this behalf.

Holdridge Ozro Collins.

WANTED

Numbers of Volumes III, IV, V, VI, of the Bulletins to complete files.

Address the Secretary, Room 719 San Fernando Building, Los Angeles.

Opuntia rubiflora

OPUNTIA RUBIFLORA N. SP.

By Anstruther Davidson, C. M., M. D.

Joints obovate 4 by 6 inches; pulvini 5 to 7 in each row; spines 5 to 7, one more prominent about 1 inch long, others shorter all porrect, dusky becoming whitish after the second year, bristles numerous. Areolae on fruit about 25. Flowers red, seeds similar to those of *O. occidentalis*.

Type station Hollywood near reservoir. Frequent throughout the San Fernando Valley.

This species is nearest *O. occidentalis* and is most readily identified by the color of the flowers. The plant is less tall than *O. occidentalis* as it tends to spread laterally while the smaller joints give it a more compact appearance.. The spines in number and coloration stand intermediate between *O. occidentalis* and *O. littoralis* less numerous in each areola than in the latter and more so than in the former.

We have two common Opuntias on this coast. *O. occidentalis* ranges from the coast line to the foothills and interior valleys. *O. littoralis* on the other hand is more limited to the coast line, but may extend some distance inward as at Hollywood, where the two may be found growing together.

ADDITIONS TO THE FLORA OF LOS ANGELES COUNTY IN 1916.

By Anstruther Davidson, C. M., M. D.

The activity of the members of the Botanical Section of the Academy has increased our list of county plants by some interesting additions besides adding the few new species new to science that have already been published in the Bulletin.

The following list includes those species heretofore omitted or not previously recorded as occurring in our limits. The name of the collector is added in parentheses to each notation.

Muhlenbergia squarrosa Heller. Mt. San Antonio. (Burlew.)

Leavisii rediviva Pursh. Mt. San Antonio. (Burlew.)

Allium Parishii Wats. Mt. San Antonio. (Burlew.) San Gabriel Canyon (Davidson).

Boschniakia strobilacea Gray. Trail to Mt. San Antonio (Burlew).

This curious plant, more common in the north, has only once before been collected in the south, Lemmon having long ago dis-

covered it in the San Bernardino mountains. In the north it is reported as always being found on the roots of manzanita. In this instance Mr. Burlew says there were no manzanita shrubs in the neighborhood; no note was taken of the other vegetation.

Drudeophytum villosum, C. & R. Mt. San Antonio, the type station (Burlew).

Lotus leucophaeus Greene. North Fork San Gabriel (Miss Mohr).

Parnassia cirrata Piper. North Fork San Gabriel (Miss Mohr).

Silene Parishii Wats. Ice Box Canyon, San Antonio, at 5000 feet.

This interesting plant has been considered as characteristic of the Hudsonian and higher zones, but its range is more closely allied with that of the white fir. These two may be found associated in the mountains and the canyons irrespective of elevation.

Monardella micrantha arida Hall. Mt. San Antonio (Burlew).

Ericameria cuneata Gray. Ice Box Canyon. This was once before reported from Rubio Canyon. It exists on the rocky slopes of all our higher streams.

Gilia floribunda Gray. Modjeska's Ranch, Orange County. This has been reported from Riverside County.

Polygala californica Nutt. Modjeska's Ranch. (T. Payne.) This is the second record for this shrub in Southern California; the other station is on the trail to Mt. Wilson.

Atriplex hymenelytra

Photograph by Samuel J. Keese

*ATRIPLEX HYMENELYTRA AND ONE OF ITS HABITATS.

By
Rejoyce C. Booth, B. L.

TO the casual traveler through the high desert, either by train or road, the country offers little except a monotonous outlook on gray sand dotted with gray-green greasewood, and dark green, grotesque Joshua trees or Cleistoyuccas. But to the dweller in the Mojave River Valley, the desert has a more cheerful prospect, for he has ample water from the wells, and fertile soil. He has, too, the opportunity of a closer acquaintance with the native vegetation and finds it not limited to greasewood and Joshuas. Under the bushes, where the winds have mounded the fine dust, the rains and spring sunshine bring out many varieties of dainty, brightly-colored flowers. They bloom in cycles, these short-lived desert plants, and where one week the mounds have been covered with purple, the next will find them palely yellow or deeply gold. In a couple of months the hot dry air has taken the surface moisture, and the kaleidoscope passes.

There is one desert plant, however, that is an all-the-year-round delight. It changes with the seasons, but is always beautiful. It asks for little water, and only a tiny bit of soil with just enough room to squeeze its roots between the rocks. It is commonly known by various names—goose-foot, salt-bush and desert holly, but the most suitable and charming is that of "Ghost Holly." It is unfortunate that the popular fancy in nomenclature so often gives the same name to similar but quite different plants. The appellation of "Desert Holly" has been made not only to this Atriplex of the Goose-foot Family, but also to the Perezia Nana, a Compositae of Arizona and Texas,

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*The botanical term Atriplex hymenelytra is a Solecism, and like so many of the technical words in the sciences, its combination of Latin and Greek cannot be translated.

The word *Atriplex* is an ancient Latin name of obscure meaning but undoubtedly a corruption of the Greek *Atraphaxis*, the name of an edible garden herb called orache, a plant somewhat similar to spinach.

Hymenelytra is composed of two Greek words—*Hymen*, the God of Marriage, and *eleutron*—a cover or sheath.

In entomology the word *hymenelytra* is applied to the forward pair of more powerful wings which serve as a protection to the delicate posterior pair.

Perhaps the term, "The wedding veiled Holly" would approximate the meaning of the botanical name, although the plant is really not a Holly, this familiar appellation having been given it by reason of the resemblance of the sheen and the spiny curved edges of its olive green leaves to the well known *Ilex aquifolium*.—Note by the Editor.

growing only two or three inches high. The latter's resemblance to eastern holly is more particularly in the stiff, smooth leaves with prickly edges. "The effect of the whole plant is of a little sprig stuck in the sand." Atriplex hymenelytra grows to a bush over two feet high, and two or three feet across, without the sharp points on the leaves.

It is found sparsely in central and western San Bernardino County, California, and more abundantly in Arizona and New Mexico. An isolated patch grows northeast of Bryman Station on the Mojave River, on the lower southern slopes of three high buttes. The soil is granite in all stages of disintegration, from large boulders to fine dust, but the plants do not grow in the loose earth. They are hard to dig up because the stems, branches and roots are very brittle, and the latter are covered by, and twist around large stones, but do not go down much over two feet, as there is no underground moisture, and the rainfall is only six to eight inches. It is difficult to tell in a plant that has been washed free from earth where the stalk ends and the roots begin, for the external structure and appearance are almost identical. They are woody, fibrous and gnarled, reminding one of the dwarfed and deformed trees of the Japanese gardener.

Desert holly is becoming better known not only in the Southland, but in the east as well. There is an insistent demand for it from the florists at Christmas, and a clipping from a Chicago paper, last December, stated that the very latest style in doing up Holiday packages was to tie to them a tiny spray of "California white holly." It is not of rapid growth, for it has to fight for its very life, and though now rather plentiful, a few seasons of popularity will exterminate it, except in rough, inaccessible spots.

Its right to be called holly at all is only from the curly leaves which look spiked on the edges, but are not so. During the late winter and spring they are soft and velvety, somewhat succulent and salty, of a lovely whitish-gray color underlaid with a tinge of greeny-lavender. From May to January they gradually dry out, so that by Christmas the greenish hue is gone, and the name "Ghost Holly" is entirely appropriate. In the early stage it is like Dusty Miller, and in the later, like Edelweiss.

The plant puts out its new growth from January to May, when the underlying green of leaves and small stems is very pronounced. But in addition, the tiny new leaf and flower buds, are alternate, growing to an inch across and three-quarters of an inch in length, the main veins pronounced, the fine ones not visible without a magnifying-glass.

The flowers are dicecious, very minute, growing close to the stalk at the base of the leaves, in clusters of a cerise,

magenta or even crimson color. The seed-vessels are roundish, about as thick as the leaves and of the same color, and grow close together on the stalk, giving the appearance of a bunch of gray flowers.

This Atriplex will transplant easily to a California garden, where if well watered the leaves increase in size and quantity, and the whole bush presents a solid mass of velvety green-gray, without a stem showing. It seems probable that it could be grown in the east if given some protection from the extreme cold, because the temperature along the Mojave River goes down sometimes to 10° in December and January.

The Mojave River Valley is one of great beauty, picturesqueness and interest. From old settlers, one can get tales of the Old Mormon Trail, of the Indians who were a harmless, peaceable lot, of cattle-rustling and prospecting and desperado hunts, all within a generation. The rich land along the bottoms was taken up early and has been cultivated for half a century, or used as pasturage, but a quarter of a mile to the east, where begin the slopes to the foothills, the dry, sandy, rocky soil offered no inducements to agriculture, though in the winter and spring the cattle found forage in the filaree and other green plants. It has been only within the last five years that an underground flow of water—a veritable second Mojave River—has been discovered, which is bringing in new settlers, who are establishing modern wells, pumping plants and an irrigation system. The soil and climate are found to be perfect for many kinds of deciduous fruits, especially apples and pears. Two ranches have taken the first prizes for apples, over the whole state.

The river flows near or at the base of a Mesa, about two hundred feet high at the highest part, which slopes gently upward and westward, to Antelope Valley. To the east, the land rises more rapidly to a range of hills, four miles distant, every foot of which has undoubtedly been prospected many times, and many claims staked out; first for gold and silver which occur in varying quantities, later for lead, zinc, iron, lime, chalk, cement-rock, brick-clay, and recently for tungsten.

The ride to the hills is singularly beautiful, especially in spring, through large greasewood bushes with their tiny, puffy, yellow blooms, small Joshuas, wild asters, a mass of lovely lavender, a variety of cacti with vivid cerise and scarlet flowers, and many other kinds of desert flora. One is sure to see several jack-rabbits, but no cotton-tails nor little brush-rabbits, as they keep near the river bottom. In the spring and summer there are always land turtles to be found, varying in size from two or three inches to over a foot. Chipmunks, field-mice and the amusing kangaroo rats, traveling apparently on their hind

legs only, are seen scampering about; and occasionally horned toads, bull and garter snakes, the beautiful red-racers, king snakes (mortal enemies of the rattlers), rattlesnakes themselves, and worst and most feared because they give no warning, the coral snakes and deadly sidewinders. There is a demand for rattlesnake oil, supposed to be a panacea for rheumatism, so that in killing the reptiles one not only decreases the pests but can make fifty or seventy-five cents each in addition.

Hunters can get small gray foxes, called Desert Swifts, wild cats, lynxes, coyotes and skunks. One man last winter made $60.00 from skunk skins. Of birds, there are crows, blackbirds, hawks, ground owls, butcher birds, orioles, road-runners, blue birds, red birds, meadow larks, linnets, and most numerous, the little gray desert birds.

From the river to the foot of the Three Buttes where Atriplex is found, is a three and a half-mile rise of about six hundred feet, and to the top of the highest butte perhaps one hundred and fifty feet more. From there one can see the great cotton-wooded arc of the Mojave River for ten miles, with the paralleling line of the Santa Fe tracks, and the verdant ranches between. To the north and south stretch miles of wild land, while to the west of the river on the Mesa, are spread the rectangles of reclaimed Homesteads and Desert Claims. Nowhere are the sunsets more marvellous than here, when fleecy clouds are present to catch the evening glow, which can also be seen on the nearer hills and mountains, on the farther San Bernardino Range with Old Baldy snow-crowned for half the year, and away off to the far distant Panamints in the northwest.

We like to speak of our valley as "The Desert," because it is not one. There is no monotony of color, of landscape, of vegetation, of occupation on a new pioneer ranch, nor of passing life. The trains are a never-ceasing interest, either the regular passengers, the periodical specials for extra tourist travel and big conventions, and the Troop trains of June and July taking our men to the Border; or the freights of fifty and sixty cars, sometimes all bright yellow, carrying oranges to the Eastern markets. Along the road, The National Old Trails Highway, is to be seen an automobile at almost any hour, often a motorcycle or motor truck, and rarely a wagon and team, or a prospector with one or two burros. Sometimes there are visitors, perhaps from a machine with a far-eastern license, stopping for water; or pedestrians for health or economy, who always have interesting experiences to relate. Once a party of six moving-picture actors was entertained over night, walking from Los Angeles to New York, who expected to earn their way by giving vaudeville entertainments en route. Another time, a twenty-year-old girl arrived, dressed in overalls, traveling alone

with a burro from Denver to San Francisco. She had had tuberculosis, but was entirely well, and had gained fifty pounds in her three months' trip.

It is an absorbing occupation to take virgin land—not the rich, black, loamy sort, but sandy, rocky and apparently hopeless—and make it blossom and fructify. With a definite winter season of cold, such as does not occur on the coast side of the mountains, the growing season is not continuous, and the results are not so abundant. But there is and will be a market for all the products that shall be raised in the region, and it does not take a very keen imagination to foresee in the next generation or two, a population of tens of thousands cultivating this so-called Desert, and increasing and flourishing in the dry, wholesome altitude. An astronomer will find here almost perfect conditions for study, as the cloudless, almost windless nights and absence of humidity afford an uninterrupted view of the whole bowl of heaven.

If Dr. Van Dyke had known the Mojave River Valley, he might have closed his description of America as

"The blessed land of Room Enough beyond the ocean bars,
Where the air is full of sunshine, and the sky is full of stars."

Forsan et hæc olim meminisse juvabit.

William A. Spalding
President 1897-1898, 1909-1913

DIATOMS

By Dr. F. C. Clark.

NAVICULA CRABO

It is probably true that the natural sciences are altogether neglected by a majority of the people. A few of us dabble a little here and there, but most people who are really interested do not progress very far because of various handicaps, among which may be mentioned lack of time, lack of enthusiasm, and the lack of fundamental education so necessary to satisfactory work in any line of advanced thought.

The most attractive subjects are those that reveal to us much of the beauty in nature with but little expenditure of thought and energy. For example, the study of butterflies interests and attracts us because they are very beautiful and are easy to secure. The same is true of the flowering plants, shells and similar forms.

It is the toiler in undiscovered fields who needs skill and enthusiasm.

Those departments of science in which only a few are interested and in which we must work almost alone require workers who are willing to delve without compensation other than that derived from the knowledge gained. There are some such scientists, and there will be more of them.

Entomology is being studied quite carefully by a few in Southern California. Conchology has its able representatives here and botany, as related to the higher forms, holds the attention of some of our ablest men and women.

I am glad that all of this is true; but I wish to call the attention of lovers of nature to a group of plants little known to most of us—the diatoms.

Here we have a wide field for the study of tiny forms whose beauty is not excelled by plants of higher organization.

The variety of form of diatoms and the wonderful beauty of their sculpture makes them objects of interest to all who love the harmony of symmetry.

Some of the largest diatoms may be as large as the head of a pin, but most of them are exceedingly small. They are found in untold millions in the sea, and in ponds and streams everywhere.

One day recently I met two small boys on West 6th Street with their arms full of slabs of "chalk," a generous supply of which I secured in exchange for a buffalo nickel. It proved to be very rich in diatoms of great variety and beauty. Upon inquiry I learned that it had been found on New High Street in this city.

The time of the appearance of diatoms in geological formations is still uncertain since the authorities do not agree upon this point. Some hold that, though so simple in structure, they made their appearance in comparatively recent times—as late as the Cretaceous. Others believe that they date much farther back—even to the Devonian or the Silurian.

Their range is world-wide. No temperature is too low for them.

They are found in unthinkable billions as far north as man has penetrated and the tropics teem with them. They swarm in the hot springs of the temperate zones. I have found them in the hot water of the springs of Calistoga in Napa County—water so hot that one could not hold one's hand in it.

In shape diatoms show a wide variation. They are "round, square, triangular, stellate, oval, ovoid, crescent, sigmoid, cuneate, bacillar, etc.," with various frills and appendages and sculpture for the further enhancement of their beauty. In addition to all this there is the refraction of light from their angular and wavy surfaces which makes them, with proper illumination, objects of beauty beyond description.

Why these little plants should be so wonderfully beautiful and yet so small that no unaided eye can see them is a mystery.

Of all these lovely things not one in a thousand trillions can ever be seen because they are so numerous.

They would make as good silver polish if they were quite plain instead of being so ornate. They would serve the purpose of making petrolium even though they were not so elaborately frilled and sculptured. They would serve in the manufacture of dynamite without their refractive powers.

The southern part of California is rich in diatomaceous earth. In Los Angeles we have the New High Street deposit, and, without doubt, others also. In Temescal canyon some excellent material has been found. On the beach at Santa Monica along the high water line lumps of earth rich in diatoms may be gathered.

At Clifton-by-the-Sea, near Redondo, thousands of tons of such material are piled high.

I have sent samples from Redondo, Santa Monica, Temescal and Los Angeles to Mr. Oliver Kendall of Providence, R. I., and he has returned to me mounted slides of the diatoms.

The accompanying photograph is of *Navicula crabo* from Temescal canyon. It is magnified 400 times.

I have the slides in my collection at my home at 526 Wilshire Boulevard, Santa Monica, and shall be glad to show them to any who may be interested.

I take this opportunity to invite nature students to visit my workshop, to see my collections and to study with me if they so desire.

I have a collection of more than 200,000 fossil invertebrates besides many recent species. I have many crabs, corals, sponges, foramenifera, and many thousands of insects of the various orders. Also many skulls and full skeletons of birds, reptiles and mammals for comparative study. These are at the disposal of any who may wish to study along these lines.

I particularly wish that some one will be sufficiently interested in diatoms to take up the study of them in the near future. I shall be glad to render what assistance I can.

Abbot Kinney
President 1898-1900

NOTES ON ZAUSCHNERIA

By George L. Moxley.

In the most cursory examination of even a small series of specimens of *Zauschneria*, either in the field or herbarium, one cannot help noticing the great differences in the foliage, both as to the size and shape of the leaves, and their pubescence or lack of it. The floral differences are not so marked, but even here there are differences that may well be taken into account.

Nearly thirty years ago, Dr. E. L. Greene said in reference to the genus under consideration, "When I look at the strongly marked forms of this genus, as they exist in our herbaria—some of them nearly glabrous, others heavily villous, some of them hoary with a coarse tomentum, others fairly white with a pubescence so minute as to appear like a mere bloom; some with veinless, others with strongly feather-veined leaves, the margins of which are, in this form entire, in that sharply toothed—I wonder whether authors in allowing but one species of *Zauschneria*, have not been dazzled and then misled by the large Fuchsia-like corollas of these plants: for it is evident they must have been looking to the corollas for specific characters, just as if the genus were an ally of *Fuchsia*, rather than of *Epilobium*." He further pointed out the fact that *Zauschneria* is most intimately related to that part of *Epilobium* in which the corollas present no specific character whatever, and nearly everything is rested upon pubescence taken along with the insertion, venation and toothing of the leaves. With this in view I have made this present study of such specimens of *Zauschneria* as I have been able to collect or borrow, in the hope that it may incite some one with better facilities than I can command to make a proper revision of the genus.

There can hardly be a difference of opinion as to the fact that the forms of *Zauschneria* naturally fall into two groups; the one having flat, thin, feather-veined leaves, the other narrow, more or less pubescent leaves in which, but for the midrib, the veining is not evident.

In his Flora of Los Angeles and Vicinity, Prof. Abrams makes mention of *Z. Californica* var. *microphylla* Gray, and *Z. Californica* var. *latifolia* Hook, making no mention of typical *Z. Californica* Presl., which, I infer, he does not find within the limits covered by his book. Prof. Jepson, in his Flora of Western Middle California, describes the forms occurring in his region under *Z. Californica* Presl., incidentally mentioning the var. *latifolia* Hook. Dr. Greene contends (l. c.), with some show of reason, that the plant of the southern coast, which Dr. Gray named var. *microphylla*, is without doubt the original plant of Haenke, and, therefore, the typical *Z. Californica* Presl.

With these brief references as a preliminary I pass to my notes on the specimens it has been my privilege to examine. These have been, in part, communicated by Dr. A. Davidson, Mr. S. B. Parish, and Mr. F. W. Peirson. Some are from the Herbarium of the Southern California Academy of Sciences, and some are of my own collection.

I give first of all the label on the specimen under consideration, in quotations, then a more or less complete analysis of the plant and then such comments as suggest themselves. I begin with the plants from Mr. Peirson's herbarium.

"*Zauschneria Californica microphylla*. Shadow Lake, north of Devil's Post Pile, Sierra Nevada, about 9000 ft. Aug. 1914."

Sparsely villous with soft white hairs: leaves lanceolate, 15-30 mm. long, 4-10 mm. wide, lower short-petioled, upper sessile: calyx-tube narrowly funnelform above the globose base, about 20 mm. long: sepals sharply triangular, about 12 mm. long: petals about 15 mm. long: stamens scarcely exserted: style long-exserted: color of entire flower brilliant scarlet.

"Catalina Beach, July 1, 1907."

Gray tomentose; leaves linear, 15-20 mm. long, 2-4 mm. wide, much fascicled, tipped with a dark brown mucro; flowers not opened; calyx short-conic above the globose base, then narrowly funnelform, sparsely villous.

This is almost identical with a specimen in Herb. Davidson, collected by L. J. Yates on Santa Cruz Island and labelled *Z. cana* Greene. The Santa Cruz specimen has slightly broader leaves and a little heavier tomentum, but I should unhesitatingly assign them both to the same species.

"*Zauschneria Californica microphylla*. Kewen Lake, Pasadena."

Herbage sparsely villous with soft white hairs; leaves narrowly lanceolate, 15-35 mm. long, 4-8 mm. wide, fascicled in the axils; calyx-tube dull red, veined with scarlet, narrowly funnelform above a short-conic base; petals scarcely exceeding the sepals; stamens not exserted; style long-exserted.

This plant is of the feather-veined group and more closely approaches *Z. latofilia* than *Z. Californica microphylla*.

"*Zauschneria Californica latifolia*." A sheet of three specimens.

(a) "Little Kern. July 11, 1908."

Herbage quite hirsute, with short, rather stiff hairs; leaves broadly lanceolate, 18-30 mm. long, 7-15 mm. wide; calyx-tube cylindrical about 10 mm. above the base, then funnelform, entire length 22-25 mm., dull pink veined with scarlet; petals dark red, veined with a color so deep as to appear almost black in the dried specimen.

(b) "Sierra Nevada."

This is very much like the Shadow Lake specimen mentioned above, except for the inflorescence, the flowers being smaller and much lighter in color.

(c) "San Bernardino Mountains."

Almost glabrous, with a few short white hairs; leaves broadly ovate, terminating in a short accuminate tip, 15-20 mm. long, 8-15 mm. wide; flowers not yet opened, but the calyx much resembles (a) above.

From Dr. Davidson's Herbarium I have examined the following specimens:

"*Zauschneria Californica* Presl. var. *microphylla*. Foothills, Los Angeles, Aug. 1889 Dr. A. Davidson."

Entire plant grayish with a minute appressed pubescence; leaves linear, entire, 5-15 mm. long, 1-2 mm. wide, tipped with a small dark brown mucro; calyx-tube about 20 mm. long, funnelform above the globose base; petals about 10 mm. long; stamens exserted about the length of the petals and the style as much more; mature capsule 25-30 mm. long. The flowers in this specimen are somewhat faded, so that it is difficult to tell their original color, but it was likely a brilliant scarlet.

"*Z. Californica*. Catalina Island, Cal., June, 1891. Dr. A. Davidson."

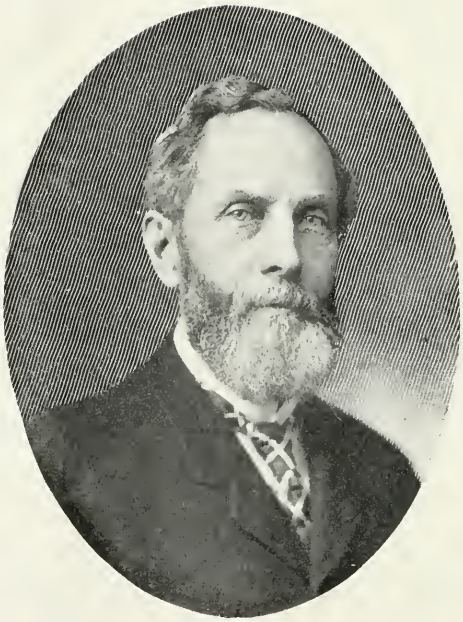
Plant gray with an appressed pubescence; leaves 5-30 mm. long, 2-5 mm. wide, mucronate and more or less remotely dentate; calyx-tube cylindrical, about 10 mm. above the pronouncedly globose base, then narrowly funnelform, total length about 25 mm.; flowers much faded.

"*Z. latifolia Greene*. Rock Creek, Los Angeles, Aug., 1901."

Herbage only slightly villous; leaves lanceolate, mostly slightly dentate, 15-25 mm. long, 5-10 mm. wide. This specimen is in fruit, and there are no flowers. Capsule about 20 mm. long.

"*Zauschneria Arizonica* Davidson. Metcalf, Ariz. In creek bottom, 5000 ft. alt. Oct. 10, 1900. A. Davidson 365. Type specimen."

For this specimen I will give the original description: "Stems one to two feet high, decumbent, branching from the base; whole plant villous, not at all tomentose; leaves ovate, one to one and a quarter inches long and half an inch broad, broadly sessile and usually strongly denticulate, feather-veined and markedly villous on midrib, veins and edges; lower leaves frequently obovate; flowers scarlet, large, one and a half inches long above the ovary; calyx-tube cylindrical for three lines above the globose base, minutely villous, lobes three lines shorter than the corolla; style exserted one inch or more; stamens somewhat



Melville Dozier
President 1904-1906
Secretary 1906-1908

less; capsule pedicellate, one and one-quarter inches long, slightly villous at base; seeds large, in form resembling those of *Z. Californica* var. *microphylla* Gray." Bull. So. Cal. Acad. Sci., 1:5, 1902.

This is certainly a striking specimen. Dr. Davidson, in comparing his plant with *Z. latifolia* Greene, further remarks: "*Z. latifolia*, as represented here, has, compared with *Z. Arizonica*,, long, narrow, lanceolate leaves, seldom more than one quarter inch broad, flowers smaller, not more than one inch long and having styles and stamens not exserted more than half an inch."

Zauschneria. Sequoia Nat. Forest, July, 1908. Davidson 1687."

Plant small, more or less densely villous with short whitish hairs; leaves more or less glandular, especially on the under surface, 10-20 mm. long, 5-9 mm. wide, denticulate; calyx-tube funnelform, about 12 mm. long. The flowers are not yet open, so it is not possible to note the characters of stamens and style. The plant in some respects, especially the size and shape of the flowers, and the glandular leaves, resembles *Z. glandulosa* Moxley, (Bull. So. Cal. Acad. Sci. 15:22, 1916), but the glands are apparently not stalked and do not appear on the calyx-tube as in *Z. glandulosa*.

"*Z. Californica villosa*, Santa Cruz Island, L. J. Yates, 1893."

Entire plant densely villous with white hairs; leaves linear-lanceolate, 10-30 mm. long, 3-6 mm. wide; calyx-tube 15-20 mm. long, narrowly funnelform above the globose base; petals about 10 mm. long; stamens and style well exserted; capsule pedicellate, somewhat villous in this specimen (Greene says "glabrous").

"*Z. cana* Greene. Santa Cruz Island. L. J. Yates. Aug., 1893."

Plant white with an appressed tomentum; leaves narrowly linear-lanceolate, densely fascicled in the axils, faintly and remotely denticulate, each leaf tipped with a small brown mucro about ½ mm. long. This specimen is not in flower so the floral characters cannot be given.

From Mr. Parish's Herbarium I have examined the following specimens.

"*Z. Californica* Presl. San Bernardino Mts., August, 1882. S. B. and W. F. Parish, No. 158." A later note says: "This is *Z. latifolia* Greene. Pitt. 1:25."

Plant somewhat hispid with short hairs; leaves broadly lanceolate, 20-50 mm. long, 10-15 mm. wide; calyx-tube constricted about 8 mm. above the base, thence widening to about 3 times the diameter at the constriction; petals scarcely exceeding

the sepals; stamens slightly exserted; style exserted about 10 mm. Flowers evidently a brilliant scarlet, as they are not much faded even now.

"*Z. latifolia* Greene. Strawberry Valley, Aug., 1901. Elev. 5000 ft. Grant."

Plant rather hispid with soft short hairs, especially on margins and veins of leaves; leaves lanceolate, 15-30 mm. long, 4-8 mm. wide, usually denticulate, somewhat fascicled; calyx-tube cylindrical 6-8 mm. above base, thence funnelform; petals scarcely exceeding calyx-lobes; stamens and style have been broken off.

"*Zauschneria Californica* Pres. Santa Rita Mts., Ariz. Coll. Thomber, No. 12. Elev. 5000 ft. 9-11-03. Distributed by the University of Arizona."

Plant erect, rigid, nearly glabrous; leaves sessile, lanceolate, 20-25 mm. long, 5-8 mm. wide, denticulate, edges somewhat crisped; calyx-tube cylindric 3 mm., then funnelform, about 15 mm. long; petals scarcely exceeding calyx-lobes; stamens and style much exserted; capsule long-pedicellate. This plant approaches in general appearance *Z. Arizonica* Davidson, but the leaves and flowers are rather smaller. It is, however, not at all like *Z. Californica* Presl. as delimited by Dr. Greene (l. c.).

"*Z. Arizonica* Davidson." Which see above.

"*Z. Garretti* A. Nels. Cache County, Utah, Logan Dry Canyon. 8 Aug., 1909, Charles Piper Smith, No. 1987. Det. A. Nels." Proc. Biol. Soc., Wash. 20:136, 1907.

Plant woody and rigid, somewhat hirsute, the hairs long and widely spreading; leaves oval or ovate, 20-30 mm. long, irregularly and remotely denticulate, sparsely hirsute; calyx-tube narrowly funnelform, slightly puberulent, 15-20 mm. long; petals deep scarlet, slightly exceeding the calyx-lobes; stamens and style not apparent in this specimen, but stigma said by Nelson to be tardily well exserted; capsule puberulent, short pedicellate.

"*Z. Californica* Presl.; Avalon, 6 Aug., 1902. 5024."

Collector's name not given, but probably Mr. Grant. A later note says: "*Z. Californica* var. *microphylla*." Another note says: "Rev. Mr. Robertson says this is distinct and peculiar to Catalina."

Stems glabrous with a pinkish tinge; leaves gray-green with a minute appressed tomentum, 15-30 mm. long, 2-4 mm. wide, tipped with a small brown mucro; calyx-tube 25-30 mm. long, somewhat constricted above the bulbous base;, thence narrowly funnelform; petals scarcely exceeding the segments of the calyx, veined and deeply lobed; stamens exserted a little more than the length of the petals and the style about twice the length of the stamens; capsule long pedicellate, minutely glandular.

I can find very little difference between this specimen and one in the Herbarium of the So. Cal. Academy of Sciences, collected by F. Grinnell in Bailey Canyon, San Gabriel Mts., Sept., 1911. The latter specimen has somewhat smaller leaves, which are considerably more fascicled, but otherwise I can see no difference. Another specimen, also in the Academy's Herbarium, collected in Laurel Canyon, by Mr. and Mrs. Grout, labelled "*Z. microphylla* Gray," shows only about the same differences as Grinnell's. I should consider all three *Z. Californica* Presl., as delimited by Dr. Greene.

In the Herbarium of the Southern California Academy of Sciences I find but seven sheets of *Zauschneria*, two of which are mentioned above. A third, collected at Sierra Madre, by Miss Mohr, no date given, is evidently identical with those just mentioned, only having slightly smaller leaves and flowers, due, probably, to its having grown in a dryer situation.

A sheet of Davidson's *Z. Arizonica*, to which species reference has before been made, needs no further mention.

"*Z. latifolia*. San Bernardino Mts., Cal. July, 1911. Miss Mohr."

Herbage soft hirsute with spreading hairs; leaves lanceolate, 15-30 mm. long, 5-8 mm. wide, irregularly denticulate; flowers small, deep scarlet.

"*Z. Californica* Presl. Common along dry places, May to Nov. Avalon, Santa Catalina Island, Cal. Nov. 1900. Blanche Trask."

This is practically identical with the plant in Mr. Parish's herbarium, to which extended reference has been made above. There are no flowers, but several ripe capsules.

"*Zauschneria*. San Luis Obispo, Cal. Miss Thekla Mohr. 1911."

Plant evidently tall and robust; herbage almost entirely glabrous; leaves narrowly lanceolate, thin and feather-veined, 15-40 mm. long, 3-6 mm. wide, minutely denticulate, fascicled in the axils; calyx-tube 25 mm. long, slightly constricted 10 mm. above the bulbous base, thence funnelform; petals about one-third longer than the sepals; stamens slightly and the style long exserted; capsule glandular, short-pedicellate.

This plant seems to be quite distinct in foliage from any I have examined. In floral characters it seems in no way different from other forms of *Z. latifolia* Greene.

Z. glandulosa Moxley, Bull. So. Cal. Acad. 15:22. 1916.

Mr. H. S. Swarth, to whom the type sheet of this species belonged, is now connected with the Museum of Vertebrate Zoology at Berkeley, Cal., and has placed this sheet in the Herbarium of the University of California. It will not, therefore, be

found in the L. A. County Museum, as stated in the above reference.

Z. viscosa Moxley. Bull. So. Cal. Acad. 15:22. 1916.

A co-type of this species has been placed in the Herbarium of the University of California.

The following are in my own herbarium:

"*Z. latifolia* Greene. Arroyo Seco, San Gabriel Mts. Geo. L. Moxley, 281."

Leaves lanceolate, nearly entire, some faintly denticulate, covered with a dense mat of short soft white hairs.

"*Z. latifolia* Greene. Strawberry Peak, San Gabriel Mts., elev., 6150 ft. July 23, 1915. Geo. L. Moxley 423."

Very tomentose with long white hairs, covered with white, stalked glands; leaves sharply serrate.

"*Z. Californica* Presl. Sawpit Canyon, San Gabriel Mts., Sept. 6, 1915. Geo. L. Moxley 444."

Leaves much fascicled, small and very narrow, gray with a minute appressed tomentum.

"*Z. Californica Presl.* Hills near Southwest Museum, Los Angeles, Cal. Oct. 12, 1915. Geo. L. Moxley 452."

This specimen differs from those in the Herbarium of the So. Cal. Academy of Sciences only in somewhat shorter and broader leaves. The gray-green appressed tomentum, short brown mucro, and prominent midrib are identical. This plant has been attacked by some insect which causes the formation of rosettes of broader thinner leaves resembling a small green rosebud. I have frequently noticed this on *Zauschneria* near Los Angeles.

My sincere thanks are due Dr. A. Davidson, Mr. S. B. Parish, Mr. F. W. Peirson, and Mr. H. S. Swarth for the extended loan of specimens from their herbaria, without which even this brief study would have been impossible.

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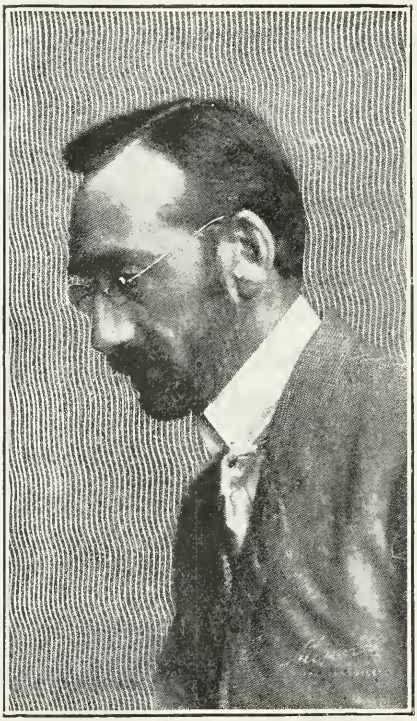

Bernhard R. Baumgardt
Secretary 1893-1906
President 1906-1909

REPORT OF THE SECRETARY

PRESENTED AT THE ANNUAL MEETING

OF THE

SOUTHERN CALIFORNIA ACADEMY OF SCIENCES,

JUNE 14, 1916.

THE activities of the Academy during the last season, in interest and profitable achievements, have not fallen below the record of any prior year.

The approval, by the members of the Academy, of the work of the Directors, has just been manifested by their unanimous re-election for the year before us.

Notwithstanding our very moderate income, and the demands upon it for the current expenses of the Academy, and particularly for the payment of rent for a hall, upon every occasion when a meeting of the Academy has been held, under the most rigid economy and careful inspection of all claims, by that Watch-dog of the Treasury, Director Keese, we commence the new year with all debts discharged and a small balance on hand to our credit.

During the year there have been five meetings of the Directors for discussion and the management of business affairs.

The Academy has given six lectures which have been free to the public and which have been upon subjects of general interest, viz:

A Permanent Home, owned by the Academy.

The Customs of the Stone Age on Catalina Island.

Cambodia, and Its Ancient and Modern Geographic Limits.

Oersted's Experiment or the Beginning of the Electrical Age.

The Great Canyons of Arizona and New Mexico.

The Romance of Human Civilization.

The interest in these several discourses was intensified by the various, beautiful and most graphic views thrown upon the screen from the lantern.

The greatest expenses we are called upon to discharge are the cost of publishing our Bulletin and the rent of hall for meetings of the Academy.

As to the Bulletin, I can only reaffirm what I reported in my Annual Statement of last year. It is received with favorable comment from scientific bodies located in widely separated countries all over the world, and the demand for exchanges and individual copies is constantly increasing. I regret to say that our very limited income prohibits larger editions, and the additional mailing expense.

We have lost two valued members,—Edward Wolsey Coit, and David R. Brearley, who both died at Los Angeles, the former on September 25, 1915, and Mr. Brearley on January 5, 1916.

The bequest of $10,000.00 to the Academy by the late Bancroft E. Beeman has not been received, but we are informed that the executrix will be able to pay this amount into our treasury at an early date.

A spacious and commodious hall has been tendered to us by the management of the South West Museum, located at Avenue 46 and Marmion Way, for the exhibition of our fossil mounts, our conchological, ethnological, ornithological and other collections, and the greatly needed opportunity for placing our Library in an accessible condition.

With two or three exceptions, all the mounts of fossils from La Brea excavations, now upon exhibition in the Museum at Exposition Park, belong to this Academy of Sciences, and preliminary arrangements have been made by our Board of Directors for an amicable agreement with the Board of Supervisors for the removal of these La Brea fossil mounts or duplicates thereof. At this date it is impossible to state the conditions which will be exacted by either our Academy or the Board of Supervisors, but the sentiment of our Directors seems to indicate that the Academy will make an absolute gift of all said mounted fossils, to the County of Los Angeles, provided the Board of Supervisors will appropriate a sum sufficient for the mounting of duplicates from the fossils now stored in the basement of the Museum Building.

The subject of changing the name, and character of publication of our Bulletin has been seriously discussed, but no definite action in this behalf has, as yet, been taken.

It is earnestly hoped, if members have any numbers of Volumes III, IV, V and VI of the Bulletin, which they do not wish to retain, that they will send them to the Secretary that he may complete defective files.

Holbridge O. Collins,
Secretary.

ARTHUR B. BENTON
President 1913-1916

TRANSACTIONS OF THE ACADEMY.

Directors' Meeting

A duly called meeting of the Directors was held on Wednesday, August 28, 1912, in the office of the Secretary, at the hour of one o'clock P. M. Present, Messrs. Spalding, Knight, Davidson, Parsons, Watts and Collins.

Mr. Collins announced that he was preparing to take his daughter upon a voyage around the world, expecting to be gone at least a year, and inasmuch as this Academy should have constantly at its home office a Secretary who could act with all the authority pertaining to that office, he resigned his position as Secretary; and thereupon, for the purpose of having the record of this meeting duly engrossed and certified, he was elected Secretary pro tempore.

Mr. Arthur B. Benton was elected Secretary for the unexpired term.

Mr. Collins reported that he had sent to the Museum Building, for temporary keeping, all the half-tones, electrotypes and cuts,—the accumulation of many years,—used in illustrating the several volumes of the Bulletin, all the back numbers of the Bulletin now remaining, and most of the volumes and monographs of the Library, retaining only a few volumes for the use of the Secretary and members, who would find it inconvenient if not impossible to go to the Museum Building.

This disposition of the Academy property was approved.

Board adjourned.

Holdridge O. Collins,
Secretary Pro Tempore.

Omitted, by error, from publication of former Transactions of the Academy.

Academy Meeting.

The January, 1916, meeting of the Academy was held on the eleventh day of the month in the Friday Morning Club House.

Mr. William A. Spalding presented an address upon "Oersted's Experiment or the Beginning of the Electrical Age."

Academy Meeting.

On February 17, 1916, at the regular monthly meeting of the Academy, the members were greatly interested by a discourse from Dr. George LeMont Cole, describing the Great Canyons of Arizona and New Mexico and the remains of the ancient Cliff Dwellers. His very graphic relation was illustrated by views upon the screen.

Directors' Meeting.

A Directors' meeting was held in the Union League Club on Thursday, March 30, 1916. Present, Messrs. Alliot, Benton, Collins, Davidson, Keese, Parsons and Watts.

The Treasurer gave a statement of the financial condition of the Academy, and the Secretary made a report regarding the numerous letters he was constantly receiving from Institutions for advanced students, Libraries and Scientific Bodies from all sections of the United States, desiring to be placed upon the distribution list for our Bulletin, and that the present income warranted neither larger editions nor a more frequent issue of the Bulletin.

An extended discussion followed upon ways and means, and for enlarging our work, but definite action was deferred to a future meeting.

The resignation of William A. Knight from his position as Director, Chairman of the Astronomical Section and member of the Committee on Program, was accepted

Directors' Meeting.

A regular meeting of the Board of Directors was held on May 8, 1916, in the office of the Treasurer. Present, Messrs. Alliot, Benton, Keese, Parsons, Watts and Davidson.

In the absence of the Secretary, Mr. Parsons was appointed Secretary pro tempore.

Prof. Alliot tendered to the Academy the use of a hall in the Southwest Museum, of ample space for its Library and exhibition of its collections in the several branches of science, and rooms for the transaction of such work as may be necessary in its activities. His offer was accepted with thanks and Mr. Benton was authorized to make such arrangements as may be feasible with the Board of Governors of the Museum of History, Science and Art, and the County Supervisors, for the transfer of our collections to these new quarters.

The Committee on Program reported that it had secured Prof. G. E. Bailey for a lecture on the "Use of Explosives in Agriculture," and Mr. E. L. Doheny for a lecture upon the "Oil Fields and Great Wells of Eastern Mexico."

Mr. Thomas L. O'Brien was elected a Director for the unexpired term of Mr. Knight, who had resigned.

Mr. G. Allen Hancock, Mr. George H. Beeman, and Mrs. Mary A. Beeman were elected Honorary Members, and Mr. Beeman was elected a Fellow of the Academy.

Mr. Beeman reported that by reason of legal technicalities in the administration of the estate of his father, the late Bancroft E. Beeman, the bequest of $10,000.00 could not be distributed at present, but he had reason to believe that the legacy would be paid in the near future.

Board adjourned.

Directors' Meeting.

At a meeting of the Directors held on June 14, 1916, present, Messrs. Benton, Collins, Keese, O'Brien, Parsons, Spalding and Watts, Mr. Bernhard R. Baumgardt was elected an Honorary Member of the Academy, all fees and dues being remitted.

The election to membership of Mr. Thomas L. O'Brien at a former meeting of the Directors was made a matter of record.

Mr. Samuel J. Keese was appointed Chairman of the Astronomical Section.

There being no further business the meeting adjourned.

Academy Meeting.

The Annual Meeting of the Academy was held on Wednesday, June 14, 1916, in the Friday Morning Club Building, for the election of Directors and the transaction of such business as should be presented.

The President appointed Messrs. Collins and Parsons as tellers to take charge of the polls, and the election resulted in the unanimous choice of the following named gentlemen, to-wit: Hector Alliot, George H. Beeman, Arthur B. Benton, Holdridge O. Collins, Anstruther David-

son, Samuel J. Keese, George W. Parson, William A. Spalding, Albert B. Ulrey, William L. Watts and Thomas L. O'Brien.

Louis de Schweinitz, Mrs. Line B. de Schweinitz and William Lacy were elected members of the Academy.

The Secretary presented his Annual Report, which was ordered to be printed in the July Bulletin, and Mr. Keese submitted his Annual Accounts, which were referred to the Board of Directors.

Mr. Bernhard R. Baumgardt was the lecturer for the evening. His subject was, "The Romance of Human Civilization," and the unusually large audience received the eloquent and instructive statements of the speaker with enthusiastic applause. His discourse was accompanied with many beautiful views illustrating the evolution of the human race from a condition of savagery to its present state of intellectual culture; and the announcement by the President of the election of Mr. Baumgardt as an Honorary Member was received with emphatic approval.

Directors' Meeting.

A regularly called meeting of the Directors was held in the rooms of the Jonathan Club on Thursday, July 6, 1916, at which all the members of the Board were present except Davidson, Spalding and Ulrey.

The gentlemen who were the Officers of the Academy during the last year were severally re-elected to the same positions, and the President re-appointed the old Committees.

The annual accounts for the year 1915-1916 of Mr. Keese, the Treasurer, which were presented at the Annual Meeting of June 14, 1916, and referred to this Board, were verified, approved and confirmed.

Notice was given of the death on January 5, 1916, of David R. Brearley, who was a member of this Academy and a subscriber to the Life Membership Endowment Fund.

After adjournment the gentlemen of the Board were entertained at lunch by Mr. Keese.

Holdridge O. Collins, Secretary.

Botanical Section.

The regular meeting was held February 24th, 1916, in the Music Room of the Public Library. Dr. Davidson showed specimens of plants collected on Mt. San Antonio by Mr. Fred Burlew. Also a number of specimens left to the Academy by the late Dr. H. E. Hasse.

Mr. T. W. Minthorn communicated a number of specimens to be mounted and added to the Academy's Herbarium.

Mr. F. Grinnell, Jr., presented some flowering branches of *Berberis Nevinii* which he had collected in the Pacoima Wash near San Fernando.

At the meeting of March 23rd, Dr. Davidson, unable to attend, sent the specimens presented at the last meeting by Mr. Minthorn, which have been mounted and named. Nearly all were from the vicinity of Lundy, Cal. A pleasant hour was spent in examining and discussing them.

The regular meeting was held April 27th in the Music Room of the Public Library.

Dr. Davidson, being unable to attend, sent a parcel of specimens from the late Dr. Hasse's Herbarium. Mr. T. W. Minthorn presented a new lot of specimens which will be mounted and added to the Academy's Herbarium.

Miss Browning brought some interesting flowers which had been sent to her from the desert.

Mr. Payne showed a number of plants now blooming in the wild garden at Exposition Park.

The meeting of May 25th was held in the Music Room of the Library.

Dr. Davidson showed three specimens of *Opuntia*, one of which is probably a new species. He also presented some plants from Dr. Hasse's Herbarium.

On motion it was ordered we make request of the Library to add the new magazine "Addisonia" to its files, calling special attention to the fact that it will be invaluable to Florists, Horticulturists and Botanists.

Mr. Minthorn exhibited some plants from various localities.

These, so far as available, will be added to the Academy's Herbarium.

It was announced that this will be the last meeting of the section until September.

Geo. L. Moxley, Acting Secretary.